GEOSCIENCES CENTRE: AN INTERDISCIPLINARY RESEARCH CLUSTER

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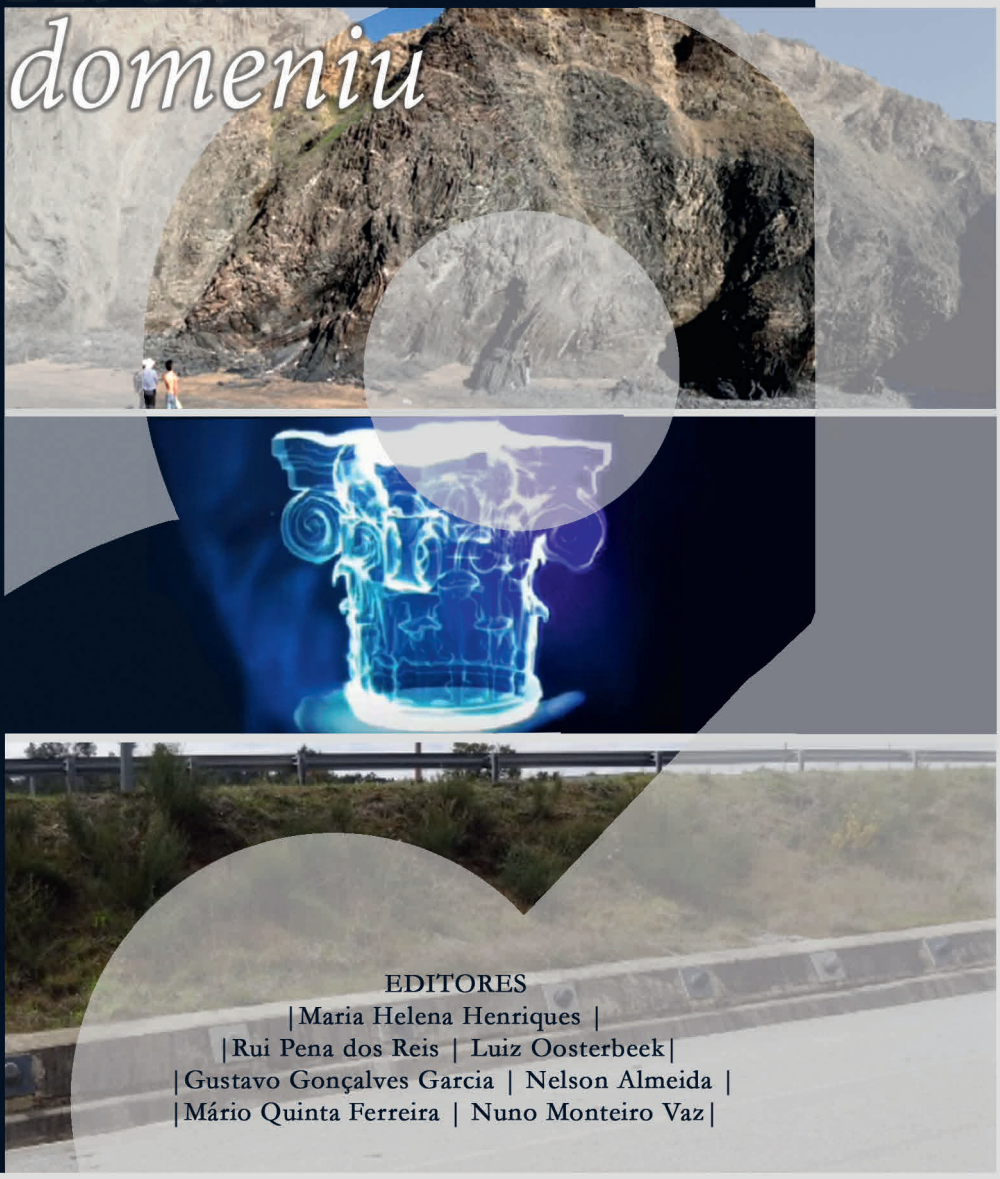

EDITORES
|Maria Helena Henriques |
Rui Pena dos Reis	Luiz Oosterbeek
Gustavo Gonçalves Garcia	Nelson Almeida
Mário Quinta Ferreira	Nuno Monteiro Vaz

INSTITUTO TERRA E MEMÓRIA

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Mação, 2017

Editores

Maria Helena Henriques, Rui Pena dos Reis, Luiz Oosterbeek, Gustavo Gonçalves Garcia, Nelson Almeida, Mário Quinta Ferreira, Nuno Monteiro Vaz

CONTENTS

Foreword

The United Nations' Agenda 2030 for sustainable development recognizes the central role of science, technology and innovation in enabling the international community to respond to global challenges. But societies need global understanding to manage change sustainably being true transdisciplinary research a primary necessity to achieve this objective.

The Geosciences Centre of the University of Coimbra (CGEO) presents itself to a new evaluation exercise 2017/2018 reinforcing its multidisciplinary nature, a crucial vision to face global challenges.

The unit is composed by junior and senior researchers who developed scientific activities in a wide range of knowledge domains: ***Exact and Natural Sciences*** *- namely Earth and Environment Sciences, Paleontology, Geochemistry, Climate research and Energetic Resources;* ***Engineering and Technology Sciences*** *- in particular in Environmental Engineering, Geological Engineering and Geotechnics; and* ***Humanities and Arts*** *– mainly focused on History and Archeology.*

CGEO strategic guide lines are: reinforcing the presence in the european research space by developing a research policy centered on the promotion of excellence, investing in quality teaching, intensifying the connections with society and the surrounding environment, and promoting a proactive, rational, responsible and thorough management of resources, based on criteria of economy, efficacy and efficiency. The strategy of CGEO derives from its vision to bridge Earth and Human Sciences into a comprehensive threefold flow: resources, their transformation and the adaptive strategies related to their use. The present volume includes recent, ongoing and prospective projects, engaging the researchers of CGEO, organized into three sequential chapters which resume this flow.

The new paradigm of sustainability requires overcoming the established division between the natural and the human and social sciences, and integrating natural and social and humanistic scientific knowledge with non-scientific and nonwestern forms of knowledge. This holistic vision of culture is shared by all the members of CGEO, who aim continuing to pursue interdisciplinary approaches in their daily investigation and development activities, under the aim of the Foundation for Science and Technology.

Coimbra, January, 2018

Maria Helena Henriques

Director of the Geosciences Center of the University of Coimbra

SECTION 1
FOSSIL ENERGY AND SUSTAINABLE DEVELOPMENT

The Group has a long record in the dimension of basic knowledge regarding traditional disciplines within the Sedimentary Geology area (e.g., Paleontology, Micropaleontology, Biostratigraphy, Sedimentology, Sedimentary Petrology, Seismic Stratigraphy, Basin Analysis and Hydrocarbon Exploration) to develop and improve the knowledge on sedimentary record of Portuguese onshore and offshore basins and characterize natural resources for further application in a sustainable perspective.

The interests of the group all converge into three major clusters: Stratigraphy, Basin Analysis and Geoconservation. The interaction between the members led to the development of projects and research initiatives pointing to:

- High resolution stratigraphy approaches supporting basin analysis studies calibrated by biostratigraphy using different fossil groups (mainly trilobites, fossil floras, ammonites, foraminifera, chitinozoans and calcareous nannofossils). These studies are oriented both to basic research (on GSSP´s, ASSP´s and on taxonomic studies) and to time constraining of regional and global events, such as paleogeographic framework, paleobiologic provinces, paleoceanic dynamis, climate changes, among others.

- Petroleum systems studies and hydrocarbon exploration projects oriented to both conventional and unconventional hydrocarbon resources (oil, gas, shale gas, etc.). These studies receive a major contribution of high resolution stratigraphy and turn this knowledge into a contribution for industrial and economic activities, namely through partnerships with oil companies.

- Natural heritage and geoconservation studies, considered to play a main role towards a balanced economic development and a major contribution aiming at significantly improve the public perception of the natural resources exploration as a sustainable and useful activity within present day societies. The group leads relevant national and international Geoconservation initiatives and conceptual approaches to natural heritage assessment and qualification. The group played an important role in the development of geoconservation activities under the auspices of the European Geoparks Network and the UNESCO Global Geoparks Network.

These actions have been developed both in Portugal and at international level, involving other European countries and State members of the Community of Portuguese-Speaking Countries, a goal to be pursued in the future.

High Resolution biostratigraphy of Lower to Middle Jurassic units of the Iberia

Maria Helena Henriques[1], María Luisa Canales[2] and Gatsby Emperatriz López Otálvaro[1]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; hhenriq@dct.uc.pt; gatsbyemperatriz@gmail.com

(2) Department of Paleontology, Faculty of Geological Sciences, University Complutense of Madrid, c/Jose´ Antonio Novais, 12, 28040 Madrid, Spain; mcanales@geo.ucm.es

Project type: Research and Innovation

Leader: Maria Helena Henriques

Coordination: Maria Helena Henriques, María Luísa Canales and Gatsby Emperatriz López Otálvaro

Team: Maria Helena Henriques, María Luisa Canales, Gatsby Emperatriz López Otálvaro, Sílvia Silva, Vera Figueiredo and André Cortesão

Instituitions involved: Geosciences Center of the University of Coimbra (Portugal), University Complutense of Madrid (Spain), National University of Colombia and Laboratório Nacional de Energia e Geologia (Portugal)

Goals: To establish biostratigraphic scales for the Lower to Middle Jurassic units of the Iberian basins based on different microfossil groups (benthic foraminifera, calcareous nannoplâncton), accurately calibrated with the standard scale based on ammonoidea. To reconstruct depositional environmental settings and infer paleobiogeographic implications based on the paleoecological analysis of the recorded assemblages.

Results:

Publication and peer revision of several articles.

M. H. Henriques integrates, since July, 2017, the Editorial Board of the *Journal of Geology and Geoscience* (SCIAEON Publisher; http://sciaeon.org/geology-and-geoscience/home.html).

She is Recognized Reviewer of *Proceedings of the Geologists' Association* since June, 2016 (IF in 2016=1.142; 21/47 Geology, Q2; 34/53 Paleontology, Q3), online: https://www.reviewerrecognition.elsevier.com/recognition/index?key=A002F298890F30D8985EA72CB9F3325320ABBE41CAEF4974.

He integrates the Editorial Board of the *Geosciences Journal* (Emerging Sources Citation Index, Web of Science), online: http://www.mdpi.com/journal/geosciences.

Outputs:

Articles

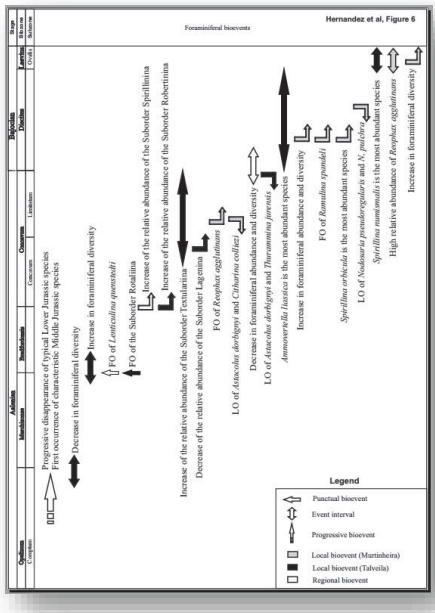
1. Silva, S. C.; Canales, M. L.; Sandoval, J.; Henriques, M. H., 2017. Paleoecological analysis based on benthic foraminifera of the Aalenian–Bajocian boundary (Middle Jurassic) in the Barranco de Agua Larga section (Betic Cordillera, Southern Spain), *Journal of Iberian Geology*, 43, pp. 75-96 [DOI: 10.1007/s41513-017-0005-7].

2. Hernández, L.; Canales, M. L.; Henriques, M. H., 2017. Response of benthic foraminiferal assemblages to contrasting environments during the Aalenian - Bajocian in the Iberia: a case study from the Talveila section (Iberian Range) and Murtinheira section (Lusitanian Basin), *Journal of Iberian Geology*, 59 p. (*under review*).

3. López Otálvaro, G.-E.; Henriques, M. H., 2017. High-resolution calcareous nannofossil biostratigraphy from the Bathonian ASSP of the Cabo Mondego Section (Lusitanian Basin, Portugal), *Newsletters on Stratigraphy*, 45 p. (*under review*).

Communications:

1. Correia, V. F.; Riding, J. B.; Henriques, M. H.; Fernandes, P.; Pereira, Z., 2017. The dinoflagellate cysts of the Bajocian GSSP (Middle Jurassic) at Cabo Mondego, Lusitanian Basin, Portugal, 11th International Conference on Modern and Fossil Dinoflagellates, Bordeaux, Program and Abstract Volume, p. 52.



Main foraminiferal bioevents recognized in the Talveila and Murtinheira sections (from Hernández et al., 2017; under review).

Foraminifera of the Aalenian - Bajocian of Iberia

Sílvia Clara Silva[1], Maria Helena Henriques[1] and María Luisa Canales[2]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; silviaclara55@gmail.com; hhenriq@dct.uc.pt

(2) Department of Paleontology, Faculty of Geological Sciences, University Complutense of Madrid, c/José Antonio Novais, 12, 28040 Madrid, Spain; mcanales@geo.ucm.es

Project type: European PhD in Geosciences (Geological Processes) of the University of Coimbra (Portugal)

Leader: Sílvia Clara Silva

Coordination: Maria Helena Henriques and María Luisa Canales

Team: Sílvia Clara Silva, Maria Helena Henriques and María Luisa Canales

Institutions involved: Department of Earth Sciences of the Faculty of Sciences and Technology of the University of Coimbra (Portugal) and Faculty of Geological Sciences of the Universidad Complutense de Madrid (Spain)

Goals: To deepen the knowledge about the Aalenian - Bajocian benthic foraminifera of the Lusitanian, Basco-Cantabrian and Iberian basins, and the Betic Cordillera: to establish a biostratigraphic framework based on benthic foraminifera, accurately calibrated with the ammonite based biostratigraphic framework; to reconstruct the depositional environment assigned to each basin; and to improve the paleogeographic history of the Iberian Plate during early middle Jurassic times.

Results: For the studied time interval two foraminifera based biozones were established: *Lenticulina quenstedti* (Gümbel) and *Ramulina spandeli* Paalzow, correlated with the Bradfordensis, Concavum and Discites biozones.

The results obtained from the analysis of the assemblages´ composition recorded in different sections, based on the determination of several diversity indexes, also allowed to characterize bioevents, which represent another additional tool with biostratigraphic value, as well as their range (local, basinal or regional), thus enlarging their biostratigraphic utility.

Outputs:

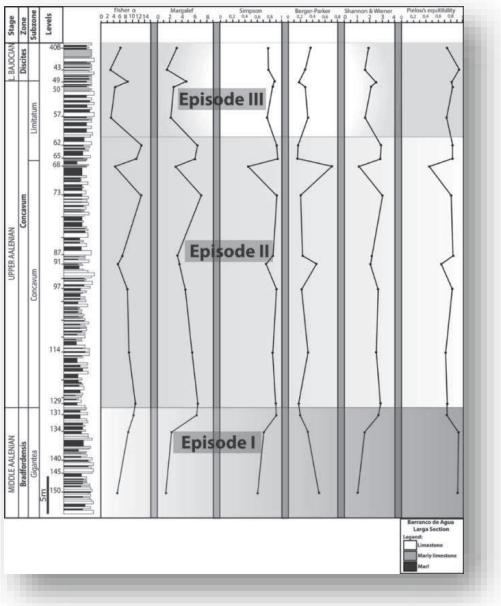
Articles

1. Silva, S. C.; Canales, M. L.; Sandoval, J.; Henriques, M. H., 2017. Paleoecological quantitative analysis based on benthic foraminifera of the Aalenian - Bajocian boundary (upper Bradfordenis - lower Discites) in Barranco de Agua Larga section (Betic Cordillera, Southern Spain). *Journal of Iberian Geology*. DOI: 10.1007/s41513-017-0005-7.

Communications

Silva, S. C.; Canales, M. L.; Sandoval, J.; Henriques, M. H., 2018. Foraminiferal Biostratigraphy of the Aalenian–Bajocian in the Iberian Plate. Global Analogues for the Atlantic Margin. AAPG European Regional Conference, Lisbon, Portugal (*submitted*).

At the final writing stage of the PhD dissertation.



Graphical representation of values of the applied diversity indexes. Richness indexes: Fisher's α and Margalef's richness. Indexes based on the proportional abundance of species: Simpson, Berger-Parker, Shannon-Wiener and Pielou's equitability. The analysis of the obtained values allows the recognition of three episodes (I – III) along the studied stratigraphic interval (from Silva et al., 2017).

Palinostratigraphy of the Meso-Cenozoic of Moa and Juruá Valleys (Acre Basin, SW Amazonia, Brazil)

Nei Ahrens Haag[1] and Maria Helena Henriques[1]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; nei.meco@gmail.com; hhenriq@dct.uc.pt

Project type: PhD in Geosciences (Geological Processes) of the University of Coimbra (Portugal)

Leader: Nei Ahrens Haag

Coordination: Maria Helena Henriques

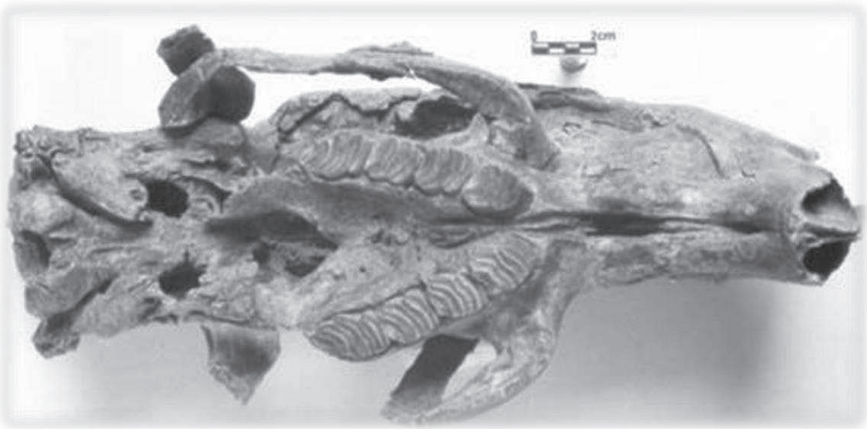
Team: Nei Ahrens Haag, Maria Helena Henriques and Eduardo Barrón

Institutions involved: University of Coimbra (Portugal), Instituto Geológico y Minero de España and CAPES (Brazil)

Goals: To establish a biostratigraphic zonation for the Meso-Cenozoic units outcropping between the Moa and Juruá valleys (State of Acre, Brazil), based on the microfossil record (pollen and spore assemblages), and to reconstruct the depositional environment of the Moa, Rio Azul, Divisor and Solimões formations, outcropping in several sections located in the Serra do Divisor and Juruá Valley.

Results: The obtained biostratigraphic framework enabled determining the stratigraphic position of the fossil record stored at the Laboratório de Pesquisas Paleontológicas of the University Federal of Acre (Campus Floresta), which has been collected during the last three decades.

The results are of major importance to support the evolution patterns of the recorded taxa, as well as to improve the paleogeographic history of this Amazonia region during Cretaceous and Cenozoic times.



Skull of Rodentia, Neoepiblema ambrosettianus (Negri e Ferigolo, 1999) stored at the Laboratório de Pesquisas Paleontológicas of the University Federal of Acre (Campus Floresta).

A e B) Paleontology Laboratory; C) Paleontology Museum – Federal University of Acre (Brazil).

Outputs:

PhD dissertation in progress.

Taphonomic analysis of coquinas (Morro do Chaves and Amaral Formations) and their relationships in the definition of the permo-porous properties of reservoirs analogous to the pre-salt of Brazil

Gustavo Gonçalves Garcia[1], Maria Helena Henriques[1], Rui Pena dos Reis[1] and Antônio Jorge Vasconcellos Garcia[2]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; gustavogarciageo@hotmail.com; hhenriq@dct.uc.pt; penareis@dct.uc.pt

(2) PROGEOLOGIA/NUPEG, Universidade Federal de Sergipe, Avenida Marechal Rondon S/n, 49100-000, São Cristóvão, Sergipe, Brazil; garciageo@hotmail.com

Project type: PhD Geosciences (Geological Processes) of the University of Coimbra (Portugal)

Leader: Gustavo Gonçalves Garcia

Coordination: Maria Helena Henriques and Rui Pena dos Reis

Team: Gustavo Gonçalves Garcia (University of Coimbra, Portugal), Maria Helena Henriques (University of Coimbra, Portugal), Rui Pena dos Reis (University of Coimbra, Portugal) and Antônio Jorge Vasconcellos Garcia (Federal University of Sergipe, Brazil)

Institutions involved: University of Coimbra (Portugal) and Federal University of Sergipe (Brazil)

Goals: The current study of coquinas deposits aims to improve the knowledge concerning the different taphonomical processes that produced the taphofacies recognized in the Morro do Chaves and Amaral Formations, in order to develop a new approach to the analysis of potential hydrocarbon reservoir, based on the relationship between coquinoid taphofacies and their permo-porous properties. As a secondary objective will be used the palynological record from the Morro do Chaves Formation, located at the InterCement Quarry, near São Miguel dos Campos, Alagoas, for paleoenvironmental and paleogeographic correlations.

Results: The Morro do Chaves Formation is mainly dominated by interbedded coquina (grainstone/packstone) and green to black fossiliferous shales intercalations organized into continuous strata. The PhD in taphonomic analysis of coquinas will allow the definition of depositional and diagenetic taphofacies for the Morro do Chaves Formation. Paleoenvironmental and paleogeographic reconstruction of the Barremian-Aptian transition in the Sergipe-Alagoas Basin (NE Brazil).

The palynological specimens identified in the Morro do Chaves Formation are related to continental floras which suggest the existence of alluvial-deltaic lacustrine depositional environment for the lower part of the Morro do Chaves Formation. Botanical affinities suggest the existence of a first depositional environment located in a plain with sparse herbaceous plants, surrounded by remote mountainous regions with arboreal plants, under humid hot climatic conditions, which receives episodic storm events and marine incursions. This depositional environment changes to an alluvial-deltaic lacustrine sabka, with the occurrence of reduced lake-level episodes associated with a closed lake basin, also suggested by the record of organisms that tolerate some salinity.

Outputs:

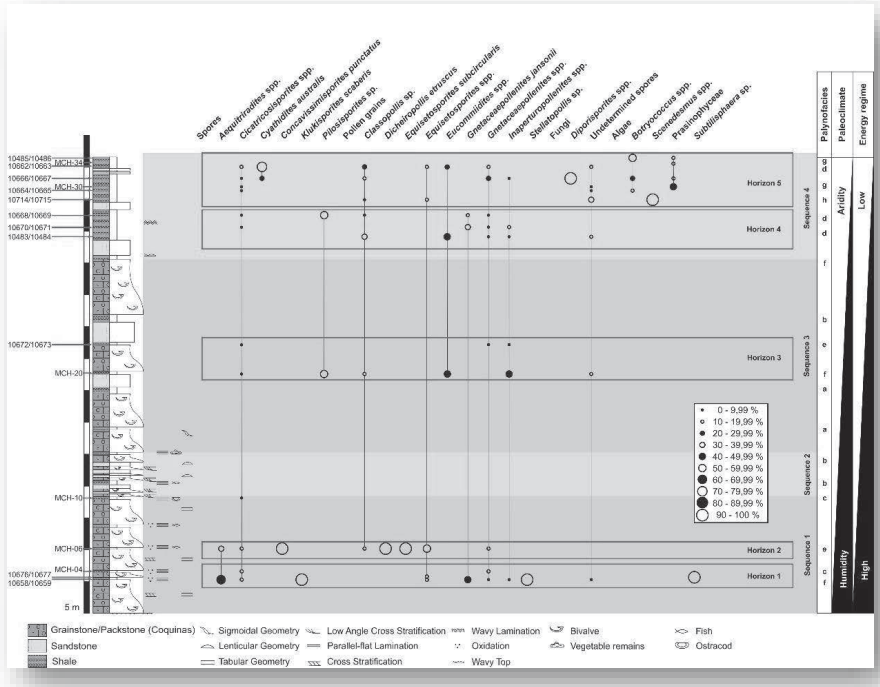
Articles

1. Garcia, G. G.; Garcia, A. J. V.; Henriques, M. H. P., 2018. Palynology of the Morro do Chaves Formation (Lower Cretaceous), Sergipe Alagoas Basin, NE Brazil: paleoenvironmental implications for the early history of the South Atlantic, *Cretaceous Research*, 20 p. (*accepted with revisions*).

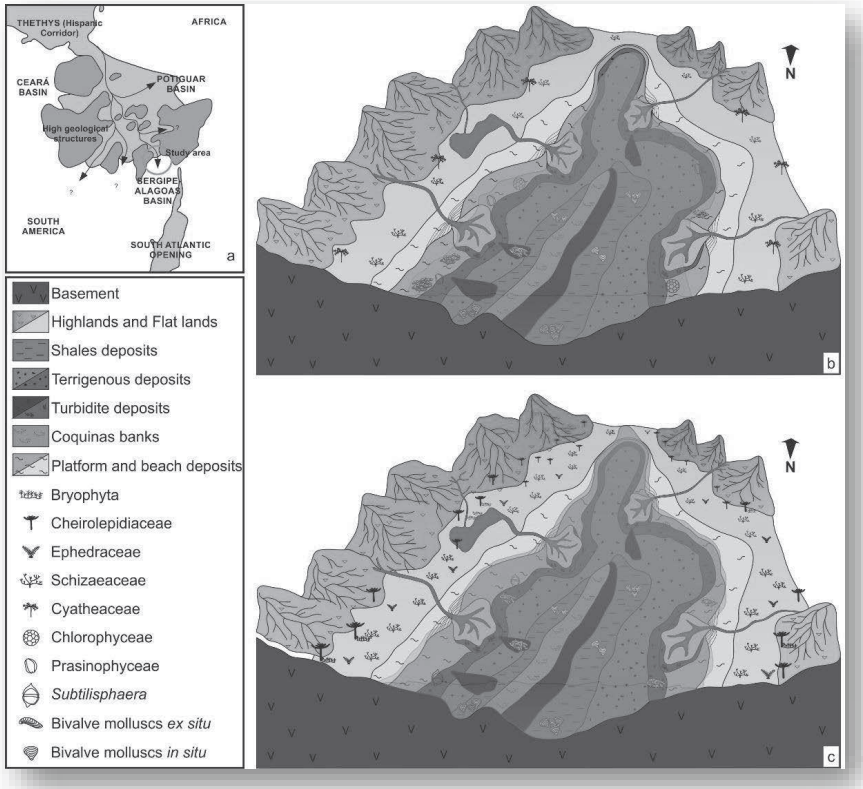
Communications

1. Garcia, G. G.; Henriques, M. H. P.; Garcia, A. J. V., 2017. Análise litofaciológica e palinológica da Formação Morro do Chaves e implicações na evolução paleogeográfica da fase de rifte da Bacia de Sergipe-Alagoas (Brasil), Libro de Resúmenes de la XII Bienal de la Real Sociedad Española de Historia Natural, Coimbra, pp. 230-231.

2. Garcia, G. G.; Henriques, M. H. P.; Garcia, A. J. V., 2018. The Sergipe-Alagoas Basin (NE Brazil) as analogue of coquina reservoir. AAPG European Regional Conference, Lisbon, Portugal (*submitted*).



Composite lithological profile, stratigraphic position of the studied samples, and palynomorph distribution with relative abundances (black dots) for each sample. Lithological profile is subdivided into four sequences and five bio-horizons. In addition, the paleoclimatic and energy regime ranges, in addition to the palynnofacies, are pointed out. (modified after Garcia, 2012; from Garcia et al., 2018, accepted with revisions).



Paleogeographic reconstruction of the study area: (a) within the Sergipe-Alagoas Basin; (b) Detailed interpretation sketch representing the alluvial-deltaic lacustrine depositional environment for the lower part of the Morro do Chaves Formation; (c) Detailed interpretation sketch representing the alluvial-deltaic lacustrine sabka depositional environment for the upper part of the Morro do Chaves Formation (modified after Garcia, 2012; from Garcia et al., 2018, accepted with revisions).

Non-Conventional Methods for Non-Conventional Plays - Surface Geochemical Prospecting for the Exploration of Hydrocarbons in the South Portuguese Zone

Gabriel de Alemar Barberes[1] and Rui Pena dos Reis[1]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; gabriel.barberes@gmail.com; penareis@dct.uc.pt

Project type: European PhD in Geosciences (Geological Processes) of the University of Coimbra (Portugal)

Leader: Gabriel de Alemar Barberes

Coordination: Rui Pena dos Reis, Paulo Emanuel Fonseca and Maria Teresa Barata

Team: Gabriel de Alemar Barberes, Rui Pena dos Reis, Paulo Emanuel Fonseca, Maria Teresa Barata, Albert Permanyer and André Luís Spigolon

Institutions involved: Department of Earth Sciences of the Faculty of Science and Technology of the University of Coimbra (Portugal), Faculty of Geology - Universitat de Barcelona (Spain) and Department of Geology of the University of Lisbon (Portugal). Direct sponsors: CNPq (Brazil), Statoil (Norway), FCT (Portugal). Indirect sponsors: DigitalGlobe (USA), LNEG (Portugal), Partex O & G (Portugal), Repsol (Spain) and Polish Geological Survey

Goals: To characterize the non-conventional petroleum coal system of the Southern Zone of Portugal through surface geochemical prospecting (identification of hydrocarbon emissions) assisted by satellite imaging remote sensing techniques (WorldView-2) and airborne gamma radiation (thorium normalization).

Results: Areas with gaseous hydrocarbon emissions on the surface were identified. A vast hydrocarbon contamination of the gasoline fraction (toluene) has been detected, which is evidence of the existence of the petroleum system, but also has implications from the public health point of view. Some artesian wells also presented worrying levels of methane, displaying great potential for explosions.

Outputs:

Articles

1. Skupio, R.; Barberes, G. A., 2017. Spectrometric gamma radiation of shale cores applied to sweet spot discrimination in Eastern Pomerania, Poland. *Acta Geophys.*; https://doi.org/10.1007/s11600-017-0089-7.

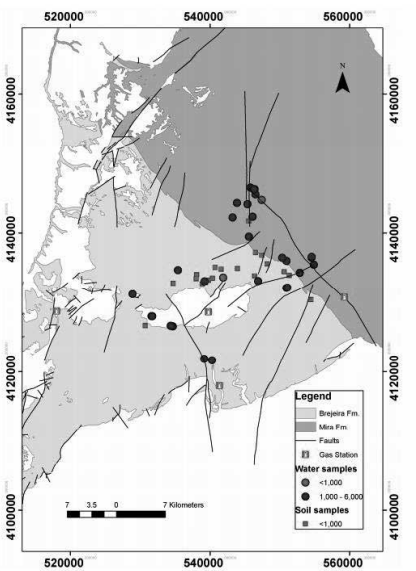
2. Barberes, G. A.; Pena dos Reis, R.; Spigolon, A.; Fonseca, P.; Bandeira, C.; Barata, T., 2018. Groundwater Natural Contamination by Toluene in Beja and Faro Districts, Portugal, *Geosciences*, 8, 9, pp. 1-18; doi: 10.3390/geosciences8010009.

Communications

1. Barberes, G. A.; Spigolon, A.; Permanyer, A.; Pena dos Reis, R.; Fonseca, P. E.; Barata, T., 2017. Surface Geochemical Prospecting of Hydrocarbon in Brejeira and Mira Formations, South Portuguese Zone (SPZ), Portugal, AAPG Annual Convention and Exhibition, 2017, Houston, AAPG Datapages/Search and Discovery, 2017. v. 90291.

PhD Thesis

1. Barberes, G. A., 2017. Unconventional methods for unconventional plays - Surface geochemical prospecting for hydrocarbon exploration at South Portuguese Zone. PhD Thesis University of Coimbra (*submitted*).



Distribution and concentration of toluene (µg/L) in groundwater and in soil samples (from Barberes et al., 2018).

Defining the subduction process: from collision to active subduction and its influence on the regional geology

Rui Carreira Pires[1,2] and Rui Pena dos Reis[1]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; pires@simula.no; penareis@dct.uc.pt

(2) Kalkulo A.S., Simula Research Laboratory, Fornebu, Norway

Project type: Industrial PhD at the University of Coimbra (Portugal)

Leader: Rui Carreira Pires

Coordination: Rui Pena Reis, Stuart Clark and Are Magnus Bruaset

Team: Rui Carreira Pires, Rui Pena Reis, Stuart Clark and Are Magnus Bruaset

Institutions involved: University of Coimbra (Portugal), Kalkulo A.S. (Norway) and Simula Research Laboratory (Norway)

Goals: Characterization of gravimetric and magnetic signal over collision, incipient and active subduction zones.

Definition of the influence of subduction zone maturity in satellite derived data.

Evaluation of the influence of mantellic differentiation and depletion on magnetic and gravimetric anomalies.

Reconstruction and modelling of the evolution of sedimentary basins associated with subduction contexts.

Build framework and workflows for multi-software basin reconstruction.

Results: Identification of geological structures associated with subduction zones based on magnetic and gravimetric data.

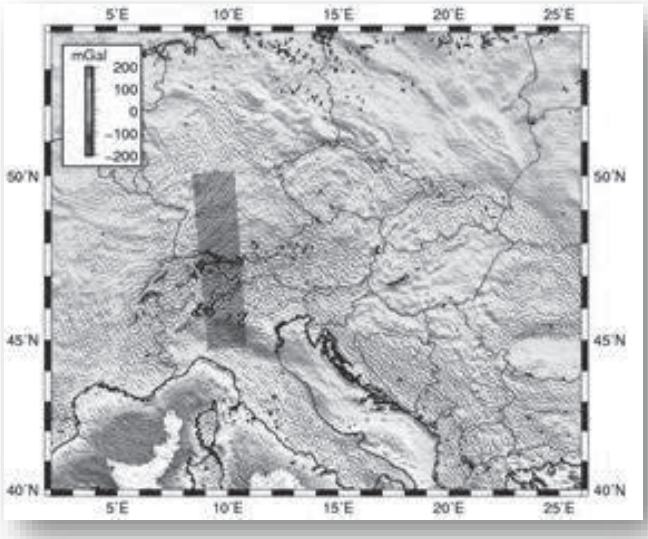
Characterization of evolutionary stages of subduction zones based on magnetic and gravimetric signal association.

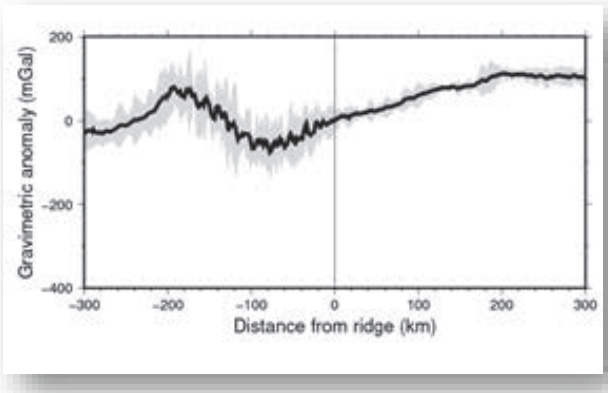
Creation of numerical models regarding the evolution of subduction zones.

Outputs:

Communications

1. Pires, R.; Clark, S.; Reis, R., 2017. Defining Incipient Subduction by Detecting Serpentenised Mantle in the Regional Magnetic Field. *Geophysical Research Abstracts*, EGU General Assembly 2017, Vol. 19, EGU2017-16345-1, Vienna, Austria (online: http://meetingorganizer.copernicus.org/EGU2017/EGU2017-16345-1.pdf).





Alps gravimetric profile from north to south.

Application of remote sensing and seismostratigraphic interpretation for the detection of oil seeps in the West Portuguese offshore

Marta Sofia Neves Reis[1] and Rui Pena dos Reis[1]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; martasonr@gmail.com; penareis@dct.uc.pt

Project type: PhD Geosciences (Geological Processes) of the University of Coimbra (Portugal)

Leader: Marta Sofia Neves Reis

Coordination: Rui Pena dos Reis, Eduardo Ivo Alves and Fernando Carlos Lopes

Team: Marta Sofia Neves Reis, Rui Pena dos Reis, Eduardo Ivo Alves and Fernando Carlos Lopes

Institutions involved: Geosciences Center of the University of Coimbra and Center of Research of the Earth and of the Space of the University of Coimbra (Portugal)

Goals: Observation of SAR images for recognition of natural hydrocarbon spills in the Portuguese offshore based on the application of the hysteresis algorithm. Analysis of 2D seismic profiles of the Peniche and Alentejo basins aiming at defining tectonic rupture structures that promote the migration of hydrocarbons.

Results: 988 SAR images and anomalous spots were recognized in 169 images. Several of these spots coincide geographically with different data pointing to natural origin.

The algorithm has proven to be adequate in the recognition of abnormal spots that may correspond to hydrocarbon spills.

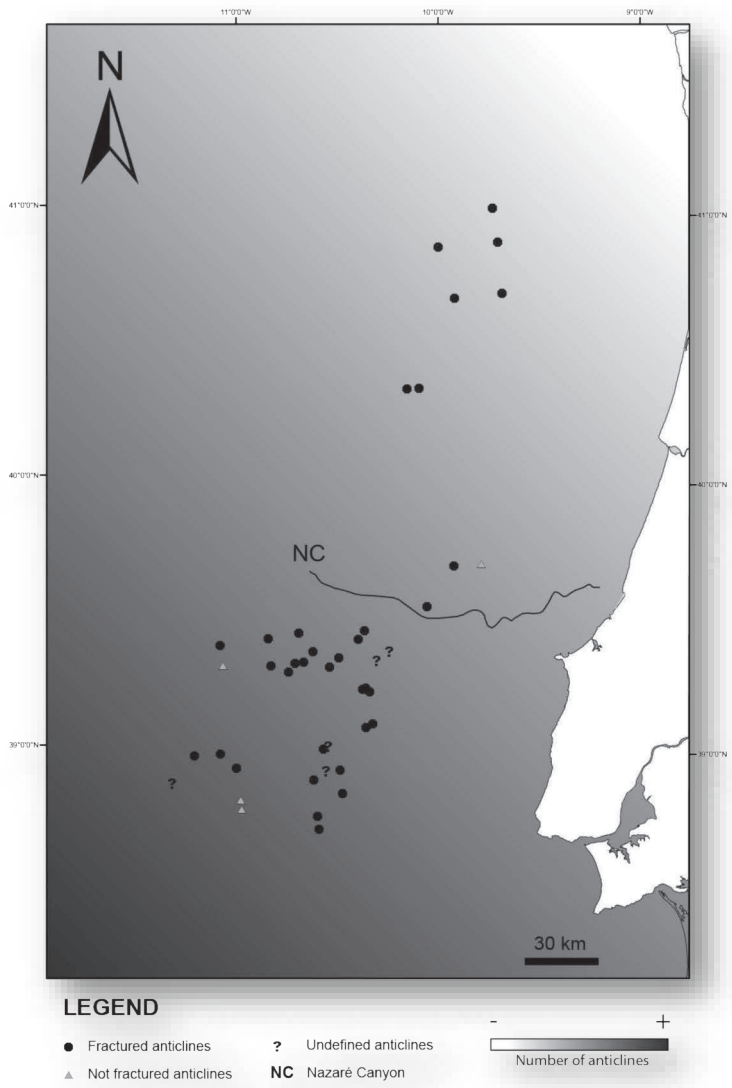
Outputs:

Articles

1. Reis, M., Pena dos Reis, R. & Alves, E. I. (2017). "Recognition of the potential risk of the Peniche Basin petroleum systems, based on a seismic-stratigraphic and remote sensing analysis" (*in prep*.).

Communications

1. Reis, M.; Pena dos Reis, R. and Alves, E. I. (2017). Identificação de oil seeps no offshore Português com base em técnicas de deteção remota, Ciência 2017 – Encontro com a Ciência e Tecnologia em Portugal, Lisboa.



Representation of the deformation spatial variation based on the fractured anticlines distribution (from Reis et al., 2017; in prep.).

Deepwater Interpretation Continental Margin Basins Salt Tectonics and Basins without Salt

Roberto Fainstein[1] and Rui Pena dos Reis[1]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; rfain39@gmail.com; penareis@dct.uc.pt

Project type: Advanced Training

Leaders: Roberto Fainstein and Rui Pena dos Reis

Coordination: Roberto Fainstein and Rui Pena dos Reis

Team: Roberto Fainstein and Rui Pena dos Reis and two MSc students

Institutions involved: Geosciences Center of the University of Coimbra

Goals: This is a comprehensive course that addresses the latest developments in deep-water exploration and production. It examines all phases of exploration from pre-planning of seismic surveys to data acquisition execution, accurate seismic interpretation, seismic maps construction, analyses of seismic attributes, definition of prospects, risk appraisal and exploratory drilling plans. Further it examines deep-water hydrocarbon production, geo-hazards, development economics and the impact of deep-water long-term oil price forecasts. The intended audience for this course concerns petroleum professionals involved in deep-water exploration and production, geophysicists, geologists, drilling engineers, rock physicists, reservoir engineers, economists and leading edge computer specialists.

Results:

2015 edition: 25 registrations

2016 edition: 19 registrations

2017 edition: in progress

Course documents

Field guide

Outputs:

Course Outline

Section 1: Continental Margins Deepwater – COB
Section 2: Geophysics data acquisition and Processing
Section 3: Deepwater Reservoirs - Stratigraphy

Section 4: Deepwater Salt Basins - Salt Tectonics: Gulf of Mexico, East Brazil, West Africa, East Canada, and North Sea
Section 5: Deepwater Basins without Salt: East Africa, Equatorial Margin, India, Southeast Asia, and Australia
Section 6: Quantitative Seismic Interpretation for Deep-Water (QI): Rock Physics, AVO, and Inversion
Section 7: Risk Appraisal, Drilling Costs - POD, Economics, Bid Rounds, Work Commitment
Section 8: Review Tour of Deep-Water Reservoirs
Section 9: Portugal continental Margin Offshore – Deepwater Assessment
Section 10: Field Trip Outline – Deepwater Exposures

University of Coimbra – Portugal
November 14th – November 17th, 2016

Deepwater Interpretation
Continental Margin Basins
Salt Tectonics and Basins without Salt

Instructors

Dr. Roberto Fainstein
SEG Emeritus - Geophysics Professor
Department of Earth Sciences Faculty of Sciences and Technology,
University of Coimbra (Polo II), Portugal.

Dr. Rui Pena dos Reis
Full Professor
Department of Earth Sciences Faculty of Sciences and Technology,
University of Coimbra (Polo II), Portugal.

Attendants of the first edition of the course "Deepwater Interpretation Continental Margin Basins Salt Tectonics and Basins without Salt" during the fieldtrip.

Intensive Courses Taught to Petroleum Industry

Roberto Fainstein[1]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; rfain39@gmail.com

Project type: Teaching and Research Development

Leaders: Roberto Fainstein

Coordination: Roberto Fainstein

Team: Roberto Fainstein

Institutions involved: Geosciences Center of the University of Coimbra

Goals: This is a comprehensive course that addresses the deep-water geology of the Continental Margins that involve the offshore geology of Portugal, Brazil, Angola, Equatorial Guinee, Guinea-Bissau, São Tomé-Principe, Mozambique, India (offshore Goa). China (offshore Macao), Malacca Straits and East Timor. In common these are continental margins that were initially explored by the great Portuguese adventurous navigators of the 15th and 16th centuries. The course examines the historical exploration of these continental margins and focus on the modern search for deep-water hydrocarbon reservoirs. Within this theme it examines comprehensively the worldwide developments in deep-water exploration and production of hydrocarbons in all of its phases of exploration, from pre-planning of seismic surveys to their accurate interpretation, seismic maps construction, analyses of seismic attributes definition of prospect risk appraisal and exploratory drilling plan.

The course encompass the deep-water geology of active and passive margins. The main geophysical data utilized for the interpretations are the regional seismic profiles integrated with geophysics potential data and results from deep-water wells and deep-sea drilling.

Comparison inferences are for the geology of conjugate margins such as the South Atlantic (East Brazil and West Africa), Transform Equatorial Margin, Algarve-Morocco, North Atlantic (Iberia and New Found-land), Indian Ocean and Far-East Archipelago.

The course is directed to all petroleum professionals involved in deep-water exploration and production, geophysicists, geologists, rock physicists, reservoir engineers, drilling engineers and economists.

Results:

Seismic Data

Deep-water libraries of seismic data have grown extensively during the last

two decades, their consistent interpretation is covered in detail with data examples and series of practical regional analyses on deep-water features of continental margins basins worldwide, focusing on deep-water reservoirs of salt basins and on basins without salt. Seismic records are examined for the characteristic seismic signatures of deep-water reservoirs and for reservoir characteristics in outcrop field exposures. Seismic data is the main tool for prospect evaluation hence the acquisition and processing of 2D and 3D data are discussed with focus on the practical use of the rather extensive seismic database libraries in deep-water. The course therefore covers the essentials of offshore seismic data from acquisition to processing and interpretation. To this effect it examines seismic tape formats, data libraries, survey design of seismic proprietary and spec surveys, data processing workflows in deep-water and the utilization of state-of-the-art interpretation software in workstations. Practical workshops review the main techniques in seismic data acquisition, processing and interpretation in deep-water and on precise structural and stratigraphic mapping. Handling of the continental slope bathymetry correction, its effect upon time and depth maps and the handling of seismic velocities, depth conversion, comparisons of 2D vs. 3D data, and the principles of 4D and of 4C seismology are discussed. Time-slice of 3D datasets, seismic attributes of amplitude and phase are applied for the purpose of better reservoir characterization and possible occurrence of fluid effects. Seismic stratigraphy relationships are examined in the proximal (slope), intermediate and distal (basin distributary fans) sequence environments.

Comparative Geology, Geo-hazards and Exploratory Drilling

The practical understanding of several aspects of deep-water geology stratigraphy and depositional environments are examined in detail as these are fundamental for successfully drilling oil and gas wells in the deep-water realm. Distinct data challenges in deep-water such as the practical problem of drilling locations, the well construction in accordance with the well depth prognosis and the finding, testing and development of deep-water productive reservoirs are described. Hydrocarbon column height, areal extent, reservoir rock physics characteristics and overall economic volumes appraisal are defined. Issues that arise in the drilling of deep-water wells such as thickness of the overburden, pore-pressure prediction, geo-hazards review examples and the guidance for soft-landing geo-steering into the reservoir are discussed. Correlation stratigraphy of reservoirs through well data are discussed with field examples.

Risk Appraisal, Development Economics, Analysis of Fiscal Regimes (PSC vs Tax & Royalties)

Cost for bidding on deep-water exploratory blocks, impact of signature bonus and the cost of the distinct phases of minimum commitment exploratory programs are discussed on several scenarios. Comparative costs of deep-water wells (dry-hole cost vs completion cost) and significance of development economics are viewed with concerns to oil price forecast and overall analysis of the deep-water project NPV (net present value). Import/export issues of seismic vessels and drilling rigs, environmental

reports guidelines and licenses approvals are briefly discussed. Comparative fiscal regime analyses of PSC's (production sharing contract) models vs tax and royalties models for oil and gas economics are analyzed in detail.

Field Trip

The field trip offers a comprehensive view of the Lusitanian Basin, many of the concepts from these onshore outcrops can be extended to the analyses of the offshore region. The Lusitanian Basin developed on a Paleozoic basement that resulted from the collision of different terranes during the Variscan orogeny. A late orogenic intra-continental basins (earliest Permian at Buçaco) pre-date the development of late Triassic intra-continental grabens, these all related to the break-up of Pangea.

The outcrops to be visited focus on:

a) Triassic rifting siliciclastic infill that was followed by thick carbonate sediments deposited during the Early and Middle Jurassic. Marine sedimentation on an epi-continental ramp and later platform shows occasional signs of tectonic instability, related to the proximity of the basin's western border.

b) The Late Jurassic that marks a new rifting episode, with intense re-activation of basement structures and erosion of rift-shoulders

c) The Early Cretaceous sedimentation which is marked by the break-up of the North-Atlantic and development of coeval conglomerates

d) The Late Cretaceous recording the beginning of the inversion of the basin, with shallowing seas, continent formation, emersion and deformation

e) The salt tectonics in the basin that started probably in the Jurassic, controlling sedimentary facies and thicknesses (above and beneath salt). The piercing of the sedimentary cover by the salt diapirs occurred during the Late Cretaceous, with continuing deformation until the Quaternary.

f) The Tertiary lithology, marked by intense inversion and up-lift of the Lusitanian Basin, usually with the re-utilization of older listric faults as new oblique-slip and reverse faults.

Exercises

Attendees are given hands-on mapping problems and exercises that cover geophysical exploration and development mapping in deep-water. Multiple mapping exercises covering normal and reverse faults handling, understanding of paleo-lows and paleo-highs, flattening of bathymetry, seismic velocities appraisals in deep-water and specific exercises for depth conversion are made. Salt tectonics models over distinct basins are examined and comparisons made for basin architectures and hydrocarbon plays of autochthonous salt vs allochthonous salt. Comparative interpretation of the main prospective deep-water regions of the world such as Gulf of Mexico, Offshore Brazil, West Africa, North Sea and Southeast Asia are effected with suite of comprehensive exercises covering structural and stratigraphic interpretation, the utilization of seismic attributes and the significance of seismic amplitudes.

Course Agenda

Day 1 Deep-Water / Seismology.

Continental Margin Basins; Deep-Water Petroleum Geology Provinces; World Distribution of Deep-Water Basins; Exploration and Production in Deep-Water.

Seismic Acquisition, Processing and Interpretation Concepts. History of the Seismic Reflection Method Offshore. Seismic Acquisition and Processing Workflows. Deep-Water Seismic Reflection Section Parameters 2D and 3D. Un-migrated and Migrated Deep-water. Seismic Sections. Dip and Strike Sections in the Deep-water realm. Comparative Continental Margin Interpretations of Post-Stack & Pre-Stack Time Migration. Pre-Stack Depth Migration Interpretation.

Structural Interpretation in Deep-Water - Examples. Seismic Stratigraphic Mapping in Deep and Ultra deep-water. Sands and Carbonates Reservoirs Stratigraphy, Deep-Water Reservoirs Stratigraphy – Major deep-water reservoirs; Turbidites (sands) and Microbialites (carbonates).

Amplitudes: DHI´s – Direct Hydrocarbon Indicators. Bright-spots - Dim-spots - Flat-spots. Seismic Attribute Analyses.AVO – Amplitude Variation with Offset Evaluations

Day 2 Deep-Water Mapping Techniques.

Map contouring exercises - anticline, rift basin, compressional basin. Map Contouring - Block Faulting. Fault Contouring. Discussion of Mapping Techniques Interpretation of deep-water records offshore rifted margins. Well Location and Drill-Maps – Well Prognosis.

Data Comparisons: Gulf of Mexico, Offshore Brazil and West Africa, North Sea, Equatorial Margin, Australia Northern Shelf/Slope, Southeast Asia Timor and Arafura Seas, Andaman Sea, West and east coast off India, Caspian Sea, Barents Sea. Seismic Stratigraphy Discussion and Exercises

Mapping Exercise #1: Top and Base Salt Mapping in deep-water. Pull-up correction base salt. Bathymetry correction. Mapping Techniques - Time and Depth Map Contouring in deep-water. Examples from Iberia Peninsula.

Mapping Exercise #2: Syn-Rift Mapping. Seismic Velocities, NMO, RMS, Dix Equation. Depth Conversion; PSTM and PSDM.

Mapping Exercise #3: Turbidite Plays Offshore Brazil, West Africa, GoM, India, Asia. Mapping Techniques Precision.

Mapping Exercise #4: Southeast Asia. Makassar Strait, South Irian Jaya, South China Sea, Palawan Basin, West Natuna Sea.

Deepwater Petroleum Systems: Source Rock Burial, Migration Paths, Reservoir identification - bright spots, dim-spots, flat-spots. Attributes: amplitude, frequency and phase, windowed attributes. Gas seeps and gas hydrates recognition. Overpressure prediction

Day 3 Exploration History, Deep-water Prospect Risk Appraisal, Exploratory Well Construction, Geo-Hazards, Economics.

Brief Overview of Petroleum Exploration History (Onshore & Offshore): Brazil, West Africa, GoM, India, Southeast Asia, Portugal

Prospect Generation; Wells Location and Depth Map Construction. Risking of Deep-Water Prospects. Geo-Hazards Discussion: (GoM) Macondo, North Sea, Southeast Asia

Bidding Process – Signature Bonus - High Bid Predicament; Fiscal Regimes – Production Sharing Contracts, Tax & Royalties; Feld Development - Project Economics

Day 4 Field Trip. - Lusitanian Basin Outcrops

The outcrops to be visited shall focus on:

The Triassic rifting siliciclastic infill which is covered by thick carbonate sediments that were deposited during the Early and Middle Jurassic. Marine sedimentation on an epi-continental ramp and later platform shows occasional signs of tectonic instability, related to the proximity of the basin's western border.

The Late Jurassic that marks a new rifting episode, with intense re-activation of basement structures and erosion of rift-shoulders

The Early Cretaceous sedimentation which is marked by the break-up of the North-Atlantic and development of coeval conglomerates

The Late Cretaceous, that records the beginning of the tectonic inversion of the basin, with shallow seas, continent building, emersion and deformation

The salt tectonics deformation in the basin that started probably in the Jurassic, controlling sedimentary facies and thicknesses. The piercing of the sedimentary cover by the salt diapirs occurred during the Late Cretaceous, with continuing deformation until the Quaternary.

The Tertiary, marked by intense inversion and up-lift of the Lusitanian Basin, with the re-activation of older listric faults as new oblique-slip and reverse faults.

Discussion Topics:

Software Evolution; Interpretation reviews with leading edge software; Course Review: Thematic discussion, topics, questions/answers. Multiple Choice Test – Certificates Distribution to Participation

Year 2016:

1) Viet-GazProm (Hanoi):

Deepwater Seismic Interpretation

2) AAPG ICE (Cancun):

Deepwater Interpretation of Continental Margin Basins Salt Basins and Basins without Salt.

Year 2017:

1) KOC – Kuwait Oil Company (Kuwait):

Structure and Stratigraphic Seismic Interpretation

Burgan Oil Field – World´s Largest Producing Siliciclastic Reservoir – Petrel Mapping

2) Husky Taiwan & CPC-Chinese Petroleum Co. (Taiwan):

Deepwater Seismic Interpretation

3) Migas- Minyak dan Gas Bumi Indonesia:

Course effected in three batches all in Abu Dhabi – MLC Schlumberger - United Arab Emirates (UAE)

4) Seismic Sequence Stratigraphy – Pertamina - Indonesia

Course effected in Bali, Indonesia

5) Structural Seismic Interpretation

Open Course – Pau (France):

Year 2018: 1) Planned Seismic Interpretation Courses: Coimbra (Portugal), Brazil, Ecuador, France, Kuwait, UAE, Taiwan.

Outputs:

Course Themes

Theme 1: Deepwater Seismic Interpretation
Theme 2: Deepwater Interpretation of Continental Margin Basins Salt Basins and Basins without Salt
Theme 3: Structure and Stratigraphic Seismic Interpretation
Burgan Oil Field – World´s Largest Producing Siliciclastic Reservoir – Petrel Mapping
Theme 4: Migas- Minyak dan Gas Bumi Indonesia – Petrel Software Interpretation
Theme 5: Seismic Sequence Stratigraphy
Theme 6: Structural Seismic Interpretation

Cape-Point setentrional most Africa. With students from Ankpla, Chad and Indonesia

At the monument of Bartolomeu Dias in Cape of God Hope.

Berkeley, IIT Mumbai, ONGC Collaboration to Advance Understanding of Deccan Traps-related Geology and Basin Formation Processes Offshore Western India

Roberto Fainstein[1]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; rfain39@gmail.com

Project type: Research Project

Leaders: Roberto Fainstein

Coordination: Roberto Fainstein

Team: Roberto Fainstein

Institutions involved: Geosciences Center of the University of Coimbra, University Berkeley (California), ONGC, ITT Mumbai and National Science Foundation

Goals: The Deccan Traps in northwestern India constitute the largest volcanic eruptions of the past ~120 million years of Earth history. The Deccan Traps were erupted about 66 million years ago, coincident in time with the great Cretaceous-Tertiary (K-T) mass extinction that killed the dinosaurs along with 70% of all species in fossil record, which was also coincident in time with the Chixculub impact in Yucatán, Mexico. Altogether, these three remarkable geologic phenomena constitute perhaps the most important single event in the last billion years of Earth history. Recently, our IITM-Berkeley team has discovered compelling evidence that the most voluminous phase of Deccan volcanism was triggered by the Chicxulub impact, suggesting that both phenomena – impact plus volcanism – contributed to the extermination of the dinosaurs. Understanding these causal inter-relationships is one of the most exciting challenges of modern Earth science.

Despite their obvious importance, studies of the Deccan Traps remain quite incomplete. Although the Western Ghats region of western India has received the most attention from geologists, geochemists, and volcanologists, it is likely that the largest fraction of Deccan basalt volumes were erupted offshore western India, in association with the formation of important, potentially petroleum- and gas-rich structures such as Kerala-Konkan, Mumbai, Saurashtra, and Cambay Basins, and with the volcanic-margin tectonics and sea-floor spreading that led to the rifting of the Seychelles from India just after Deccan time. Thus characterizing offshore Deccan basalt formations and their spatio-temporal relation to the Cretaceous and Tertiary sedimentary formations, respectively, below and

above the Deccan basalts, is of both enormous economic and scientific interest.

Results:

- The Chicxulub impact in Yucatán, México, and the onset of the most voluminous phase of Deccan Traps eruptions in the Western Ghats of India both occurred within ≲ 50,000 years of the Cretaceous-Paleogene boundary (KTB), at which time ~70% of all species in the fossil record perished, including the non-avian dinosaurs. A broad range of evidence (geochronological, volcanological, geochemical, and tectonic) suggests that the aerially-extensive Wai sub-group eruptions of the main Deccan sequence may have been triggered by the impact, likely due to a transient increase in the effective permeability of the existing Réunion plume head's mantle magmatic system. (Whether similar effects might be observed in the possibly even larger volume of offshore Deccan-equivalent eruptions is not known.) Several lines of evidence suggest that the impact caused an earthquake of magnitude Mw ≳ 11, or perhaps ~1000 times more energetic than any known tectonic earthquake, and therefore well outside of relevant human historical experience. The consequences of such a large geophysical event remain to be fully explored, but are likely to have involved triggering of volcanism (including the mid-ocean ridge system) as well as tsunamis in the open oceans, seiches in confined bodies of water, soft-sediment liquefaction, and mass wasting worldwide, with far-field events most likely responding to longer-period seismic waves. A particularly interesting case appears to be a deposit in the Hell Creek Formation of southwestern North Dakota ("Tanis"), where a remarkable "death assemblage" of marine and terrestrial biota were buried at exactly KTB time in a local surge deposit, most likely due to a seiche on an arm of the Western Interior Seaway. A KTB unit (Hvar, Croatia) previously identified as a tsunami deposit might also be better interpreted as having resulted from a seiche. This presentation will explore a range of possibly observable phenomena associated with the Chicxulub impact event, including, of course, the possibility that both impact and triggered volcanism contributed to the mass extinction.

- Seismic technology advances in recent years have enabled for the seismic imaging of Mesozoic strata under the K/T transition lithology boundary, a lava blanket that spreads over the continental margin and deep-water off the west coast of India. This paper describes efforts undertaken to uncover the sub-basalt features offshore the west coast of India and, consequently, its importance in understanding the geologic evolution of this large region. The relationship of the offshore lava flows, imaged by seismic, with the equally vast lava flows of the onshore Deccan Traps, now under scrutiny for accurate dating of its volcanic-sedimentary accretion at the transition boundary, adds to the knowledge of the Mesozoic stratigraphy in the Kerala-Konkan Basin thus to the entire west coast of India. Data for this investigation originates from modern 3D seismic surveys integrated with long regional 2D seismic lines these joined with potential methods regional investigations to form the basis for the geological assessment of the Mesozoic stratigraphy and key components of deep-water petroleum systems, both along the Tertiary overburden above basalt and, below it, the critical imaging

of the Mesozoic lithology. The 3D surveys acquired with long spreads and broadband processed brought in remarkable improvements with regards to the imaging resolution and coherence of sub-basalt structures these were interpreted by pairing images of pre-stack time and depth migrated lines. The offshore lava flows are part of the deep-water margin in the vicinity of the Mumbai Offshore, the main productive oil province of India and, to the south, the Kerala-Konkan basin one of the largest un-explored basins in the world. Exploration of this vast deep-water region comprise the assessment of its petroleum systems in the Mesozoic strata buried under late Cretaceous flood basalts and flanked by mantle plumes rift shoulders. The geology reconstruction of Mesozoic deposition is dependent on the imaging accuracy of seismic that cover the outer shelf, slope, rise and ocean basin plus insight on the nature of continental and oceanic crust layers under basalt. To focus on sub-basalt prospects several 3D surveys were carried out that delineated structural and stratigraphic traps that are now recognized by pinch-out wedges under K/T unconformities. The methodology of time/depth imaging allows for significant improvements of structural interpretation as it focus the faults paths displacements and rectifies horizons continuity. Sub-basalt velocity models derived from data provides for better confidence of the Mesozoic in-depth structural dynamics. Herein we present seismic interpretation results for data sets acquired with the "over-under" technique in several deep-water areas of the Kerala-Konkan Basin. These were integrated with ancillary geophysical regional lines for the purpose of understanding the nature of sub-basalt prospects for better knowledge of the Mesozoic lithology and the several episodes of intrusive dykes and sills. Further, an initial calculation of lava volumes extruded and intruded in deep-water at the end of Cretaceous time is presented for comparison studies with accurate age dating along the layered basalt volumes exposed at Deccan Traps onshore.

Outputs:

Note

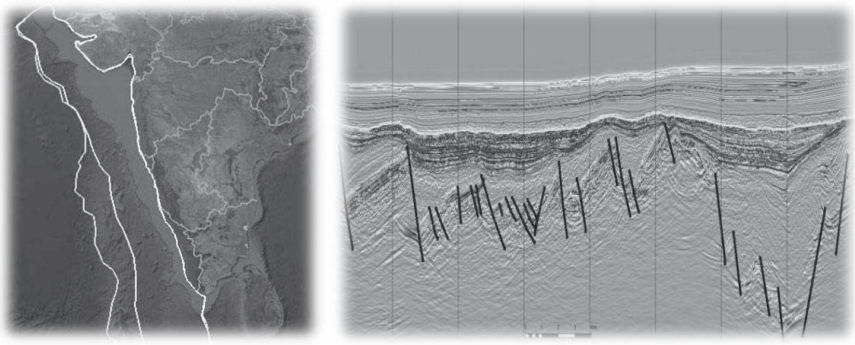
There is a very wide series of publications over the last 30 years of this project.

Articles

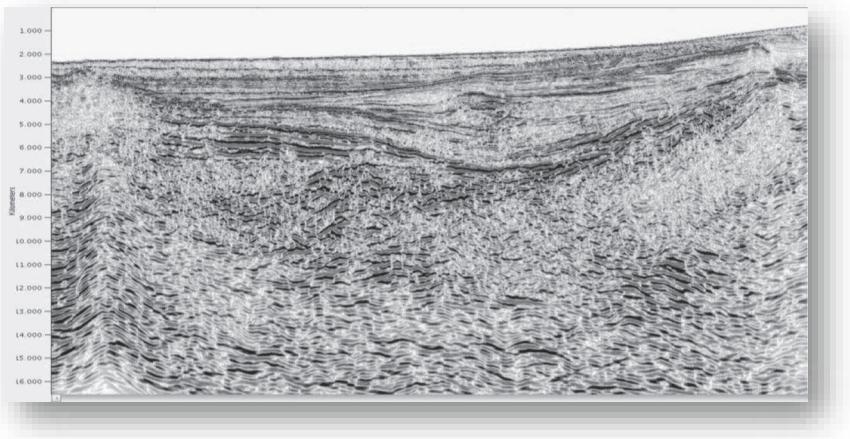
1. Fainstein, R.; Kalra, E.; Richards, M.; Radhakrishna, M.; Chandrasekkar, S., 2018. Deepwater West India – Seismic Imaging of Deccan-related Lava Flows at the K-T Boundary. Special Volume TLE, India.

Communications

1. Richards, M. A.; Renne, P.; Alvarez, W.; DePalma, R.; Mit, J.; Manga, M.; Karlstrom, L.; Vanderkluysen, L.; Fainstein, R.; Gibson, S., 2017. Triggering of the Largest Deccan Eruptions and Other Possible Geophysical Effects of the Mw~11 Chicxulub Impact. AGU FALL MEETING, New Orleans.



Estimate of lava volumes (left slide) at the K/T boundary and below it were made considering the lava blanket sills at the boundary and the deeper intrusives. The main interpretation challenge (right slide) here is an accurate mapping of the top Mesozoic, yellow marker is top Oligocene, beneath it are the high amplitudes of Eocene carbonates and from the transition boundary.



DECCAN TRAPS – WEST INDIA: K/T Boundary lava flow in deep-water seismic record.

Investigations and Hydrocarbon Exploration History of the Equatorial South Atlantic Rifted Margins - Development of the Salt Basins and Transform Margin Basins without Salt

Roberto Fainstein[1] and Webster Ueipass Mohriak[2]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; rfain39@gmail.com

(2) University of State of Rio de Janeiro, Rua São Francisco Xavier 524, Campus UERJ, Rio de Janeiro, Brazil; webmohrmail.com

Project type: Research Project

Leaders: Roberto Fainstein

Coordination: Roberto Fainstein

Team: Roberto Fainstein, Ana Krueger and Webster Ueipass Mohriak

Institutions involved: Geosciences Center of the University of Coimbra (Portugal) and State University of Rio de Janeiro (Brazil)

Goals: The rifted continental margins off Brazil and West Africa encompass several morphological distinct regions that resulted from the plate separation and subsequent drift of South America and Africa. The main building blocks that controlled the development of the Atlantic-type continental margin basins consist of prerift, synrift, and postrift tectonic stages, and these events determined the basin infill. Oceanic fractures created by transform faults that indent the continental margins form basement highs that ultimately define the tectonic edges of the continental margin basins. These boundaries are involved in the marginal plateaus, marginal banks, and characteristic marginal volcanic ridges. Major petroleum producing provinces are situated in the rifted margin salt basins and also in the equatorial transform margin basins without salt. In the salt basins, the continental slope and rise are characterized by the development of massive salt walls that delineate minibasins that were in-filled with deep-water sediments. The hydrocarbon production from these deep-water reservoirs are mainly from postsalt Tertiary and Upper Cretaceous turbidite sands, plus added production from the cluster trends of presalt carbonate microbialite reservoirs. These reservoirs are all mainly sourced by Lower Cretaceous synrift lacustrine strata, but Upper Cretaceous source rocks have also been identified in the South Atlantic salt basins.

Results: The equatorial conjugate transform margin basins are also

characterized by minor salt deposition in some regions (such as the Ceará basin). These basins produce hydrocarbons from combination traps of Tertiary and Upper Cretaceous turbidite reservoirs. All of the deep-water basins are influenced either by salt or shale tectonics and related to episodic volcanism. In the southernmost South Atlantic, volcanism dominates the conjugate margins, as indicated by thick wedges of seaward-dipping reflectors There are two main types of South Atlantic continental margins: (A) The transform margins shaped by the large offset equatorial fracture zones and in which the transverse structural lineaments are predominant, except for preexisting structuring that is not related to the Cretaceous transform directions. In these basins, where salt is absent, the typical exploratory play includes combination traps with turbidite reservoirs, generally exhibiting remarkable bright-spots amplitudes that reflect the associated deep-water channels and stratigraphic pinch-outs. (B) The rifted conjugate margins shaped by salt tectonics, which extend from Sergipe-Alagoas to the Santos basin in Brazil and the corresponding conjugate margin basins from Cameroon to Angola. Here, the typical plays are predominantly associated with autochthonous salt. The salt basins account for most of the South Atlantic's offshore petroleum production. The postsalt and presalt petroleum yields are explained by lacustrine source rock maturation during Tertiary times. Hydrocarbon migration is either into the synrift reservoirs proper or through salt windows into the postrift/postsalt reservoirs of mid-Cretaceous to Miocene. In the presalt plays, the synrift source rock and the carbonate reservoirs in the sag basin are capped either by massive salt or by a thick layered highly mobile evaporite sequence. Future exploration will need to tackle the ultra deep-water provinces near the continent-ocean boundary, where there are several potential tectonic, structural and stratigraphic targets.

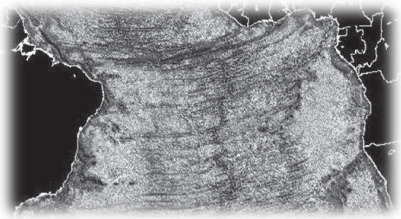
Outputs:

Articles

1. Fainstein, R.; Webster, M. U.; et al., 2018. Continental Margins of the Equatorial South Atlantic (ongoing project).

Communications

1. Fainstein, R.; Webster, M. U., 2016. Regional Investigations and Hydrocarbon Exploration History of the South Atlantic Rifted Continental Margins: Development of the Salt Basins and Transform Margin Basins without Salt. GCSSEPM.



Equatorial Conjugate Transform Margin with mirror image fractures in North Brazil and West Africa

Comparative interpretation of regional seismic profiles offshore Portugal, West Iberian Margin

Roberto Fainstein[1], Rui Pena dos Reis[1], Nuno Pimentel[2] and Bjorn Albert Rasmussen[3]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; rfain39@gmail.com; penareis@dct.uc.pt

(2) Instituto Dom Luiz, Faculty of Sciences of the University of Lisbon, Campo Grande C-6, 1749-016 Lisbon, Portugal; npimentel@fc.ul.pt

(3) Simula Research Laboratory, Fornebu, Norway

Project type: Research Project

Leaders: Roberto Fainstein and Rui Pena dos Reis

Coordination: Roberto Fainstein and Rui Pena dos Reis

Team: Roberto Fainstein, Rui Pena dos Reis, Nuno Pimentel and Bjorn Albert Rasmussen

Institutions involved: Geosciences Center of the University of Coimbra (Portugal), Institute D. Luiz University of Lisbon (Portugal) and Simula Research Laboratory (Norway)

Goals: The West Iberian Margin embraces Portuguese rifted basins. These are grouped as inner basins such as Porto, Lusitanian and Algarve and outer basins such as Peniche, Alentejo and Sagres offshore. These rifted basins that originated from the closure of Thetis Ocean and opening of the North Atlantic Ocean have similar characteristics. The best known is the mostly onshore Lusitanian Basin where exploratory work has been consistent. The basins evolved as part of the Mesozoic evolution of the Iberia Peninsula, the petroleum geology history of the Lusitania basin being known through the detailed stratigraphic mapping of outcrop exposures and legacy exploratory drilling. Exploration has also been conducted in the Algarve basin where shallow water wells have been drilled. The lesser known basins are the western offshore basins of Porto, Peniche and Alentejo and the southernmost basins of Sagres and Algarve deep-water. Knowledge on the deep-water basins is essentially derived from seismic stratigraphic comparisons with Lusitanian and Algarve basins. The Lusitanian basin is developed over a Paleozoic basement terrane. Triassic rift deposits were blanketed by thick salt-rich clays. Carbonate deposition was predominant during the Early and Middle Jurassic, and Late Jurassic is characteristic of a younger rift. A Late Jurassic basin inversion is contemporaneous with the rise of salt diapirs and the rising of massive corridor salt walls. Early Cretaceous sedimentation was marked by the break-up of the North Atlantic. The Late

Cretaceous tectonic inversion, Diapirs and deformation of salt features relate to Alpine compression. Deformation continued with diapirism being regionally defined by seismic and basin outcrop exposures. The Peniche and Alentejo basins offshore have thick sections of Triassic (with salt in Peniche basin), Jurassic and Lower Cretaceous sediments. Algarve basin display influences of the Atlantic and of the Pelagian Platform of North Africa in resemblance with oblique slip features of a transform margin.

Results: This project details the interpretation of regional seismic lines over portuguese basins these clearly outlines main events such as breakup unconformities, pre-salt section, Triassic salt, Early and Upper Jurassic carbonates and Lower and Upper Cretaceous sediments. The regional interpretation differences of basin evolution were restored by computer focusing on events with salt structures, Lusitanian and Peniche, and of basins without massive salt.

Outputs:

Note

There is a very wide series of publications over the last 30 years of this project.

Communications

1. Fainstein, R.; Pena dos Reis, R.; Pimentel, N.; Rasmussen, B. A., 2017. Comparative interpretation of regional seismic profiles offshore Portugal, West Iberian Margin. AAPG ACE, Houston, Texas.

2. Fainstein, R.; Pena dos Reis, R.; Pimentel, N.; Rasmussen, B. A., 2018. Deep-water geophysics assessment based on modern seismic, gravity and magnetics data (ongoing project). EAGE, Copenhagen (ongoing project).

North Andaman Sea - Sagaing Fault, Associated Spreading Centers, Compressive Structures of Fore-Arc and Back-Arc Basins

Roberto Fainstein[1], Rajesh Kalra[2] and S. Chandrashekhar[3]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; rfain39@gmail.com

(2) WesternGeco International Limited, India

(3) ONGC – Oil and Natural Gas Corporation - India

Project type: Research Project

Leader: Roberto Fainstein

Coordination: Roberto Fainstein

Team: Roberto Fainstein, Rajesh Kalra and S. Chandrashekkar

Institutions involved: Geosciences Center of the University of Coimbra (Portugal), ONGC – Oil and Natural Gas Co (India)

Goals: The accretionary wedge complex embracing Andaman and Nicobar Islands south of Burma's Gulf of Martaban are part of an unique mountain range, about one thousand kilometers long, that extends from Cape Negrais in Burma to the northern tip of Sumatra all along the extension of Andaman Sea. This island arc complex also separates Bay of Bengal from Andaman Sea proper. The older rocks in the accretionary wedge tare either early Tertiary or late Cretaceous whereas the most recent ones are exposures of marine sediments with fossils of radiolarians and foraminifera. Coral reefs are abundant everywhere along the coast line, e.g. Sentinel Islands are composed of the newer rocks over a core structure of coral itself.

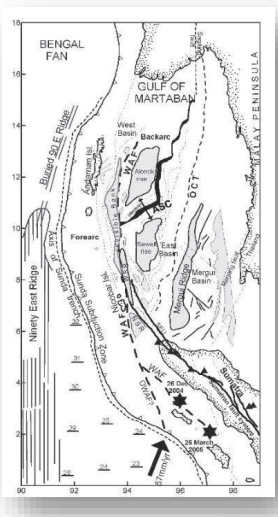
Away from the coast, in the Central and North Andaman Sea depths realm, the tectonic fabric of Andaman Sea basin has developed as a series of extensions along several mini-basins these are bound by marginal faulting that clearly separates the fore-arc and back-arc basins.

One of these faults, the so-called Diligent Fault, is essentially is the dividing boundary between an outer-arc ridge and the fore-arc basin and extends throughout the central and northern parts of Andaman Sea. This unique fault boundary is a basin margin fault distinguishable in all of the regional seismic; these also clearly recognize subsequent boundary faults the so-called Eastern Margin Fault and the West Andaman Fault. These main fault boundaries, Eastern Margin Fault and Diligent Fault originated as normal faults but subsequently were subjected to

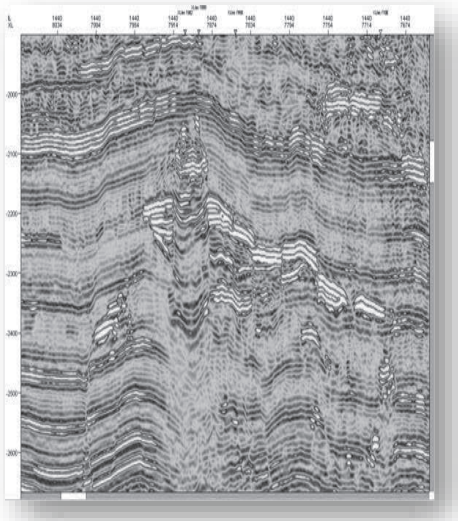
compression due to the constant strike-slip motion in the region, that extends further south as right-lateral strike-slip motions associated with West Andaman Fault. North of the Andaman Islands still the Diligent Fault appears to be connected with the Kabaw Fault of Myanmar forming thus the eastern margin of the India-Myanmar Ranges

Results: This project details the interpretation of regional seismic lines and 3D volumes over the North Andaman Sea in an area covering the accretionary wedge the foreland basins, the volcanic ridges, the volcanic basin and the back-arc basin. The volcanic ridges are separated by a nascent spreading center since the Miocene that is continued by one of the most conspicuous fault of the world ocean, straddling from Andaman Sea to the northern continent ranges of Myanmar. Due to the complexity of the forelands, volcanic arc, volcanic ridges, and back-arc basins, the whole structure and stratigraphy of the region undergo abrupt changes difficult to interpret even with state of art geophysics information. The regional interpretation differences of the several basins are inferred from seismic gravity and magnetics and yields several hypotheses for crustal and mantle evolution along the entire region. Allochtonous materials imaged on seismic appear to originate on upper mantle disseminating upwards as water vapor and gas.

Outputs:



Andaman Sea



Bright spots" expression of upper mantle gas/vapor

Technology in exploring - Southeast Asia's offshore basins

Roberto Fainstein[1]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; rfain39@gmail.com

Project type: Research Project

Leaders: Roberto Fainstein

Coordination: Roberto Fainstein

Team: Roberto Fainstein, Rui Pena dos Reis

Institutions involved: Geosciences Center of the University of Coimbra (Portugal)

Goals: In recent years, offshore Southeast Asia has seen a growing number of non-exclusive seismic surveys. These have formed the basis of regional studies in mature basins and in relatively unexplored areas, including deepwater, frontier settings. Upstream companies seeking to evaluate offshore acreage use these state-of-the art seismic data as a cost-effective way to understand regional geology and to assess the possible risks associated with prospects in new licensing rounds.

Modern, non-exclusive data are available on most of Southeast Asia's offshore Tertiary basins. These include areas in the Gulf of Tonkin in the South China Sea; Palawan basin offshore Philippines;Natuna Sea off Indonesia; the Andaman Sea; the East Java Sea basin and in the Mahakam Delta/Makassar Strait region. All of these surveys are contained within the pervasive Sunda shelf, a large craton underlain by Cretaceous metamorphic basement. Regional 2D and focused 3D seismic interpretation mapping of these areas are used for prospect evaluation and for delineation drilling.

In the pre-Tertiary basins of Eastern Indonesia and the Northwest shelf of Australia, modern, deep-water seismic data were acquired in the outer shelf and slope of the Bonaparte and Arafura basins, on each side of the Timor gap, and in the Salawati and Bintuni offshore basins south of Irian Jaya. Seismic prospects interpreted from these data constitute the basis for new license offerings. These benefit from exploration incentives granted for pre-Tertiary reservoirs, deep water and for gas exploration. Offshore xploration of Southeast Asia began in the late 1960s, with the initial seismic surveys being conducted in Indonesia and Malaysia. Major offshore oil and gas discoveries followed soon afterwards during the 1970s. During the 1990s, as many of the prospective offshore basins of Southeast Asia became mature for hydrocarbon exploration, exploring for new plays became increasingly dependent upon

modern seismic technology. Most of the offshore exploration in Southeast Asia is conducted in the Indonesian Archipelago, the world's largest, with more than 15,000 islands extending east to west over a distance of more than 3500 miles and north to south over more than 1300 miles. The large Sunda shelf of Western Indonesia delimits sea depths shallower than 200 m (Bathymetry). This shelf encompasses the Malacca Straits, Natuna Sea, offshore Southeast Sumatra, offshore North Java, East Java Sea and offshore Kalimantan.

There are more than 50 major sedimentary basins in Southeast Asia – most being situated in Indonesia – that have the potential to generate and trap hydrocarbons. The main productive basins are North Sumatra, Central Sumatra,South Sumatra, Sunda, Northwest Java, East Java, Barito, Kutei, Tarakan and Salawati (Petroleum Basins).To date, Indonesia's oil and gas fields have produced more than 15 billion barrels of oil and about 20 trillion cubic feet of gas. At present, Indonesia produces approximately 1.5 million barrels of oil per day and is the world leader in liquefied natural gas exports. Within the Sunda craton of Western Indonesia, basins are characteristically Tertiary back-arc basins. These Tertiary basins have undergone a common pattern of cyclical sedimentation linked to a series of transgressions and regressions. The sedimentary cycles are common to the entire Sunda shelf of Southeast Asia and, as a result, the stratigraphic columns of these Tertiary basins are essentially similar, although geological formation names may vary locally. The most important transgressions occurred during Eocene–early Oligocene, and late Oligocene – early-middle Miocene times. Regressions are notable during the mid-Miocene, with the main regressive event extending from late Miocene to early Pliocene. These regressive cycles mark periods of intense tectonic activity, which led to tectonic inversion of basins with consequent uplift of back-arc rifts and realignment of principal fault systems. Numerous structural and stratigraphic plays are recognised within Indonesia's basins, the main reservoir types are transgressive and regressive clastic sequences associated with structural closures and pinchouts, carbonate build-ups and reefs. Source rocks consist mostly of lacustrine shales and coals, which are abundant in the Eocene, and Oligocene sequences. Seals generally extend regionally, although occasionally interbedded shale sequences may cap smaller structures. Most depocentres are located close to producing reservoirs and the most effective migration paths are through sand carrier beds and leaky faults, which are also proximal to reservoirs.

Historically, discovery rates have been high both on and offshore. The success rate, including exploration and appraisal wells, has been close to 50%. By far the most important onshore fields are the giant Duri and Minas oil fields of Central Sumatra. Offshore, the largest oil fields are the B, E, Cinta and Widuri fields off Northwest Java and the giant Attaka and Handil oil fields off East Kalimantan. Deepwater oil plays are prominent in the Makassar Strait with a series of successes being claimed in stacked, distal Miocene sands. The Arun gas field of North Sumatra and the cluster of giant gas fields in the Mahakam delta of East Kalimantan are the most prominent gas fields at present. The major gas field of western Indonesia, the super-giant Natuna gas field, remains undeveloped.

The giant Abadi gas field is presently under development.

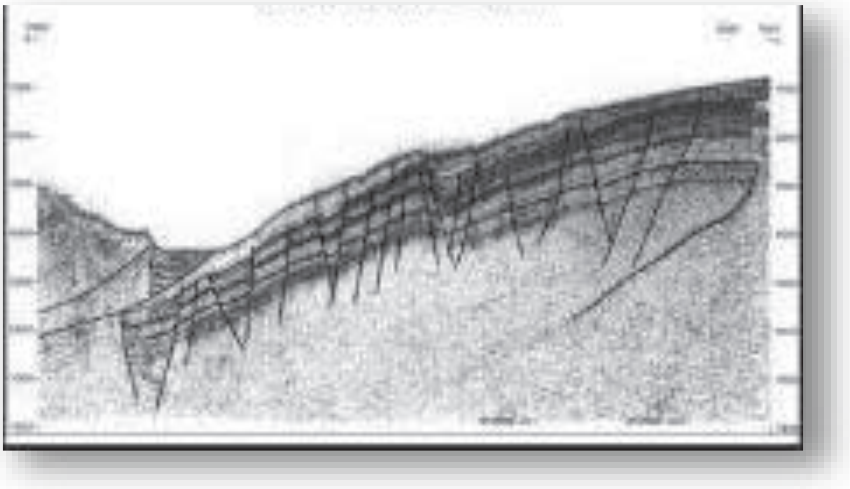
Results: This project details the interpretation of regional seismic lines and localized 3D volumes (e.g. Makassar Strait). As result of these interpretations the new major discovery of Abadi Gas Field has been effected with exclusive basis on these data. Furthermore the surveys uncovered numerous prospects in Timor Sea, Natuna Sea, North Bali, and South Papua

Reservoir characterization studies are performed now over the 3D data volumes of Makassar Strait.

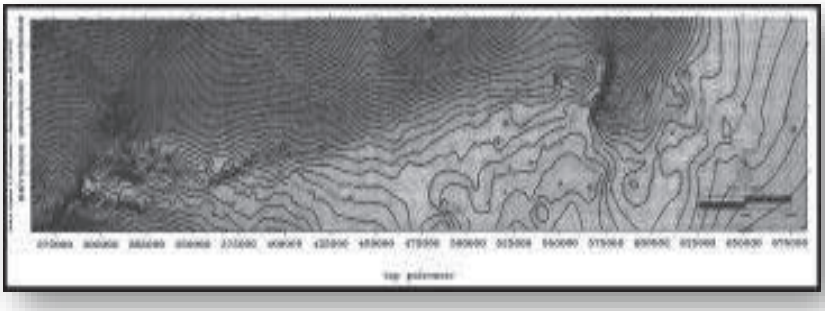
Outputs:

Publications

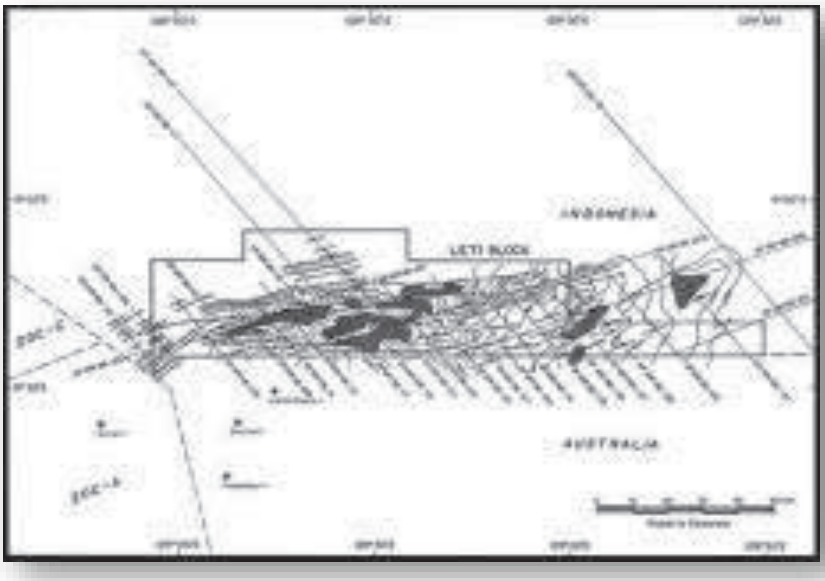
Many publications over the last 30 years of this continuos project



Imbricate faulting over Timor deep-water.



Seismic mapping Arafura Sea
Thatv led to the major gas discovery of Abadi Field.



Seismic mapping Arafura Sea
that led to the major gas discovery of Abadi Field.

Red Sea Margin: Gaussian Beam Migration (GPM) and Reverse Time Migration (RTM) Focus - Imaging in the Pre-Salt Prospectivity of Red Sea

Roberto Fainstein[1], Francisco Miranda, Anthony Goodall and Fred Snyder

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; rfain39@gmail.com

Project type: Research Project

Leaders: Roberto Fainstein

Coordination: Roberto Fainstein

Team: Roberto Fainstein, Francisco Miranda, Anthony Goodall and Fred Snyder

Institutions involved: Geosciences Center of the University of Coimbra (Portugal and Dhahran Carbonate Research Center

Goals:

Seismic Data Red Sea – WAZ & NAZ

Wide Azimuth 3D volumes and a Narrow Azimuth regional data set were acquired and processed by WesternGeco in the Red Sea for the purpose of evaluating this frontier salt basin. All three 3D WAZ marine seismic surveys were acquired using a 4 boat configuration including 2 streamer vessels with single source and 2 source vessels with a single source each. Block 1, Julayjilah SW (1862 km2) was acquired in 2010 in water depths of between 19m and 1000m. Block 2, Raykhah W (1385 km2) was acquired in 2010 in water depths of 15m–1000m. Block 3, Rabigh N (2186 km2) was acquired in 2011 in water depths of 20m -1000m. The work was managed out of the Al-Khobar

3D Grid - Acquisition Parameters

The seismic data was mapped into 3D grid coordinates (primary and secondary ordinals). Grid data traces were assigned to cells (CMP) in the 3D grid based on their midpoint XY locations calculated from their source and receiver coordinates. The WAZ survey was recorded with 2 streamers vessels, the Western Trident and WG Vespucci and 2 source vessels, the Topaz and Emerald. Survey locations of the WAZ 1,2and 3 Blocks and of the NAZ 4 Block..

Acquisition parameters consisted of 10 Sentinel Solid Streamers per vessel, with group intervals of 12.5 m, streamer length of 9,000 m, streamer depth 12 m and streamer separation 100 meters. Recording format of data was SEGD 8058, binary recording length of 10 seconds, and sample rate of 2 ms. The source type employed was a set of 4 (four) BoltGun arrays with source separation of 1000 m, shot point interval

was 25 m, array volume per source was 8475 (In^3), operating pressure of 2000 (psi), source depth 9 m.

Data Processing

Onboard processing of these data included applying a Low Cut Band-Pass Filter of 3HZ, a Zero Phasing De-signature, including cable and source de-ghosting, residual de-bubble to remove low frequency ringing and noise attenuation to remove most of the spikes and the sea-swell noise.

WesternGeco's proprietary de-multiple software called 3D GSMP was applied to remove all surface related multiples. This is a true azimuth implementation of 3D SRME used in complex geologic regions where significant 3D affects are present.

The de-multiplied data are then grouped into Super-Shots (combining 4 shots at the same location) and is the input to both the LSI GPM and LSI RTM Migrations.

Geology Challenges – Seismic Migration

The Red Sea is part of the East African rift system caused by the separation of the Arabian and African plates. In large portions of the survey a thin rugose evaporite sequence is found just under the water bottom, represented by a strong impedance contrast. This in turn causes the generation of strong multiples including water bottom, interbedded and, diffracted multiples plus high absorption of seismic energy.

Thick clean and layered salt bodies are evident in conjunction with folding and faulting of extremely high dips. On the other hand, water depths are approximately 20m-1100m and the water bottom is highly variable, all contributing to very challenging data processing.

Gaussian Beam Migration (GPM), Reverse Time Migration (RTM) Workflows - LSI – Localized Seismic Imaging

Until very recently Kirchhoff migration was deemed the best method of three-dimensional pre-stack depth migration because of its flexibility and efficiency. Its effectiveness can become limited, however, when complex velocity structure causes multi-paths of seismic energy (Ross Hill, 2001). An alternative is Gaussian beam migration, which is an extension of Kirchhoff migration that overcomes many of the problems caused by multi-path. Unlike first-arrival and most-energetic-arrival methods, which retain only one travel-time, this alternative method retains most arrivals by the superposition of Gaussian beams. An alternative to Kirchhhoff migration is Reverse Time Migration, with new implementations of the classic algorithm (Baysal, E., Kosloff, DD and Sherwood, J.W.C, 1983).

Here we utilize LSI (Localised Seismic Imagery) to focus migrated data above and beneath salt through Gaussian Beam and Reverse Time Migration. LSI GPM and LSI RTM constitute a combination work-force that can be utilized by means of interactive loop seis-flows, whereby the initial salt bodies are revisited each time.

For LSI-GPM, 57,000 super-shots were separated into two frequency bands, one central at 15hz and another at 25hz, subsequently these super-shots were

decomposed using different beam size and sorted in offset domain. For all of the shallow section there is marked improvement due to coherent enhancement of steep reflectors and low frequency reduction, however the deeper stratigraphy still needs further refinement, due to the severe mute applied to final stack image.

Concerning the LSI-RTM, it was run using the same super-shot input as LSI-GPM, and overall stack image has higher resolution than LSI-GPM due to the smearing effect of GPM during synthesis process.

Hence, it is concluded that for initial velocity model updates LSI-GPM allows to output offset gathers, but for further refinement and to include details in the velocity model LSI-RTM can uplift the interpretation and improve stack image (Ross Hill, N.; 2001; Xiaomin Zhao, Jianming Sheng, Ying Hu, 2009; Baysal, E., Kosloff, DD and Sherwood, J.W.C, 1983,

Red Sea Salt Basins – Pre-Salt

Throughout the Red Sea, the main rift phase, uplift and rapid syn-rift subsidence occurred around 20 Ma. Thereafter, water depths increased dramatically and sedimentation changed to predominantly Globigerina-rich marl and deep-water limestone. Within a few million years of its initiation in the mid-Oligocene the Gulf of Aden continental rift linked the oceanic crust fractured zones with the Afar plume. Syn-rift depositional conditions varied laterally and thermal re-equilibration resulted in reduction of subsidence, regional basin uplift and further rotation of faulted blocks. Post-rift evaporite deposition was extensive until Pliocene when open marine conditions were established (Bosworth et al, 2005)

Seismic Interpretation

Interpretation of the pre-salt (on RTM migrated section) is focused primarily upon the recognition of the main sequence boundaries between the basement and base of the salt, these are the rift sequence, the "break-up unconformity", the "sag-basin" and the top of pinch-out and channel reservoirs. In the "post-salt" section, the top of the layered evaporites is also clearly defined by seismic attributes, same for the top massive salt. It is interesting to note that a well path can be designed such that both post-salt and pre-salt plays could be probed in one drilling project by a directional well; this would probe the post-salt structural anticline "turtleback" and the pre-salt channels and pinch-outs compartmentalized by the syn-rift normal faulting.

Results: In the Red Sea offshore salt tectonics plays a primary role in the structural development of the basin. The basin itself is confined mostly to the areas of outer shelf, slope and rise with extended drilling activity now being carried over and encompassing the continental-oceanic crust (cob) transition region.

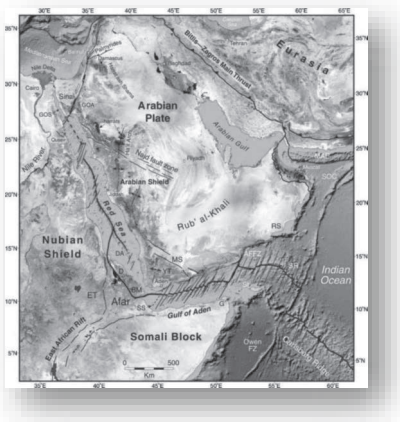
The massively deposited salt may itself represent quite diverse chemical composites, therefore salt stratigraphy is a more appropriate terminology so as to differentiate the layered evaporates from the pure halite. The massive salt forms highly mobile belts of semi-allochtonous halite bodies that thicken down-dip towards the direction of the rift system.

This project details the interpretation of new state-of-the-art seismic in the Red Sea, volume ’3D seismic details the syn-rift under salt for the break-up unconformity and sag basin, with source rock elements that favors drilling in this portion of the stratigraphy.

Outputs:

Note

There is a very wide series of publications over the last 30 years of this project.



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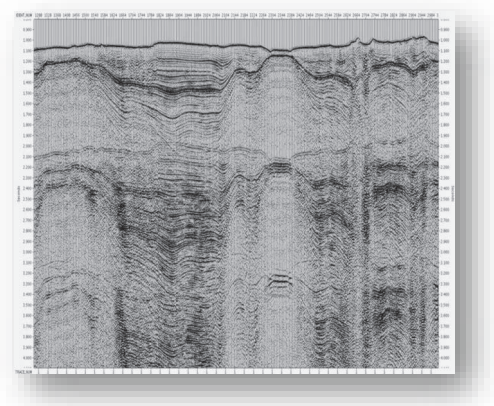
Red Sea



Typical stack section showing layered evaporite sequences, massive salt bodies and multiple energy.

Vibroseis Uniq Single Sensor Technology - 3D Volume Region near Ghawar Field

Roberto Fainstein[1]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; rfain39@gmail.com

Project type: Research Project

Leaders: Roberto Fainstein

Coordination: Roberto Fainstein

Team: Roberto Fainstein and Cherif Belguermi

Institutions involved: Geosciences Center of the University of Coimbra (Portugal)

Goals: This succinct report encompass overall aspects of the seismic interpretation and seismic inversion performed for the UniQ Single Sensor Project (29.4km x 21km = 617.4sqkm) of Mabruk/Tinat oil and gas field area. Seismic interpretation covers the methodology and workflows applied to the processed and fully migrated stack cube (23.4km x 15km = 351sqkm). As such it is inextricably tied to the petroleum geology of this region; its main seismic markers were defined in accordance with previous interpretations and results from drilled wells. Well data were tied with the final, stacked, zero-phase data volume. The interpreted seismic markers are within sequences or unconformities of the Cretaceous, Jurassic, Triassic and Palaeozoic lithology, overall 15 plus horizons markers were identified and mapped these are formation tops either of source, reservoir or seal within the dominant shallow carbonate platform stratigraphy. Production in the Mabruk-Tinat Field area is from the Permian Unaysah-A reservoirs, that consists of sand dunes reservoirs of the Palaeozoic Petroleum System, hence accurate imaging of these elusive stratigraphic targets are of foremost importance. In addition, this forefront UniQ survey permits the seismic resolution sought for the Jurassic Tuwaiq Mountain overpressure and first-hand mapping of the deeper un-explored stratigraphy of the Devonian Jauff Fm. sandstone reservoir and the Early Silurian source rock, the so-called Qusaiba“hot shale”.

Structural and stratigraphic gridded time and depth maps were produced through the seismic interpretation of horizons and in connection with the geologic restoration of the basin as derived from horizon flattening and isochrones maps over selected stratigraphy. Overall, the Mabruk-Tinat area is characterized by an elongated anticline with four-way dip closure relief bordered by a pronounced low at its western side shoulder and by a less significant depression on its eastern side. Faults and fractures are pervasive throughout particularly visible at the

deeper stratigraphy around and within the anticline with several directions of preferred orientations. Critical mapping are better investigated by a combination of geologic interpretation with physical and geometric seismic attributes. Hybrid maps of seismic contours with horizon consistent attributes of amplitude and frequency are qualitatively related to the structure, faulting and to reservoir matrix, so are frequency slices derived from spectral decomposition of selective windowed intervals.

Post-stack space adaptive wavelet equalization (SAWE) was performed connecting the derived zero-phase wavelets to drilled wells so that wavelet control is firmly established. Wavelets extracted at several well locations (after well conditioning and seismic-well tie QC) were used to design a spatially adaptive zero-phasing operator. This process assumes that non-minimum phase components be stationary and determined from the extracted wavelets, while minimum phase components are allowed to vary spatially. Therefore SAWE volume provides a zero-phase dataset that is tied to the wells and stabilized in space, furthermore its precision can be verified against blind wells.

A seismic inversion volume of relative acoustic impedance (RAI) was derived from the SAWE volume. The method used IDSI (iterative discrete spike inversion) to deconvolve the known seismic wavelet (after SAWE) on a trace-by-trace basis. It produces a band-limited spike series; and a 2Hz low cut filter that was applied prior to trace integration to generate RAI. No horizon or model-based constraints were imposed on the inversion, in order to ensure a total deterministic and data driven impedance volume. The RAI is used to characterize the whole UniQ volume from the rock physics stand-point and enables a better recognition of stratigraphic interfaces and lateral changes of facies.

Results: UniQ Uplift Resolution – Exploration Outlook

This was a successful new experiment in improving seismic resolution over deep reservoirs in Saudi Arabia This high density, full azimuth seismic dataset was acquired over the producing Mabruk-Tinat Field in East Saudi Arabia (close to Ghawar Field). Data volume was processed through anisotropic pre-stack time migration; post stack, spatially-adaptive wavelet processing and spectral balancing. Analysis of the new reflection seismic data volume shows an increase in bandwidth with improved signal-to-noise ratio when compared with legacy 3D data. Colored inversion also appears to bring a significant improvement to signal bandwidth particularly when comparing the relative impedance resolution with the legacy inversion... Data-driven relative inversion compares favorably with the well-log-derived low-frequency model. Acoustic impedance inversions were computed from the new data and benefited significantly from the increase in low frequency signal. In the final absolute acoustic impedance inversion, a portion of the bandwidth typically reserved for well-generated models was replaced by seismic low frequencies. As the methodology for incorporating seismic low frequency into the inversion process improves, so will the prediction of reservoir properties and geometry.

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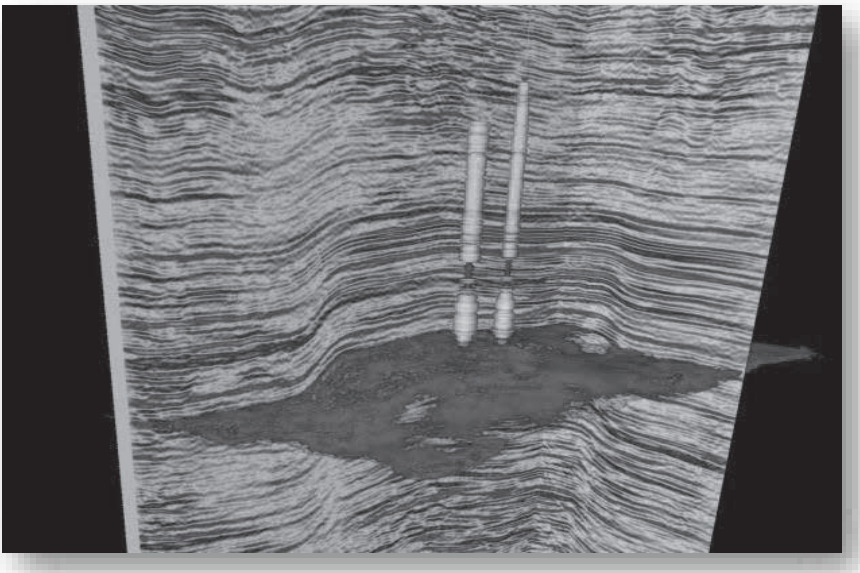
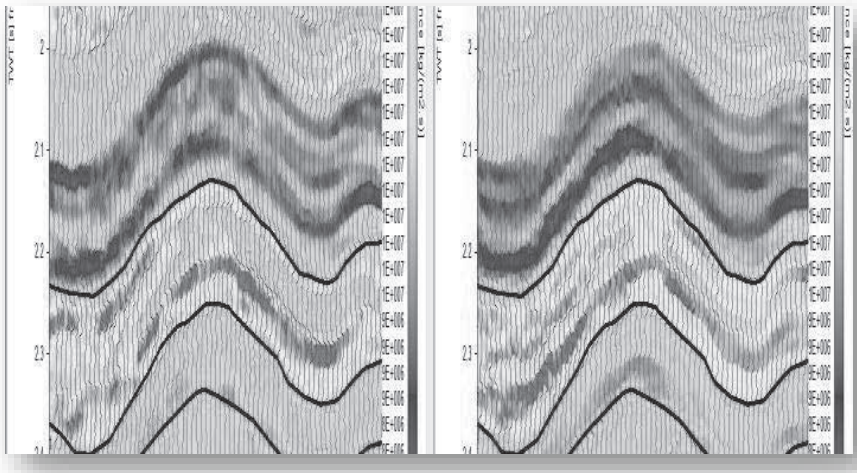
Outputs:

Note

There is a very wide series of publications over the last 30 years of this project.



3D display view of UniQ data tied with wells and the geo-body extension of the Permian reservoir sand (under Jurassic carbonate reservoir) as worked directly from data.



Acoustic impedance inversion comparison of Legacy (left slide) and UniQ (right slide) displayed with frequency cut-off at 4 Hz low-cut. The observed consistency of amplitude preservation is compelling with the UniQ data.

Basin Geology and Society

Rui Pena dos Reis[1] and Nuno Pimentel[2]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; penareis@dct.uc.pt

(2) Instituto Dom Luiz, Faculty of Sciences of the University of Lisbon, Campo Grande C-6, 1749-016 Lisbon, Portugal; npimentel@fc.ul.pt

Project type: Research and Innovation

Leader: Rui Pena dos Reis

Team: Rui Pena dos Reis, Nuno Pimentel and Gustavo Gonçalves Garcia

Institutions involved: Center of Geosciences of the University of Coimbra and Institute D. Luiz University of Lisbon

Goals: Academic research on sedimentary basins and collaborative projects with the oil industry. Our sedimentary basins show the record of the Western Tethys opening and closure, as well as the Central & North Atlantic birth and development.

Analogues in outcropping or even underwater basins, together with large amounts of acquired data, are a major tool for exploring new frontiers or even mature provinces.

Therefore our main goal is to provide collaborative solutions together with oil industry to reach successful economic discoveries in O&G in the Iberian Margin.

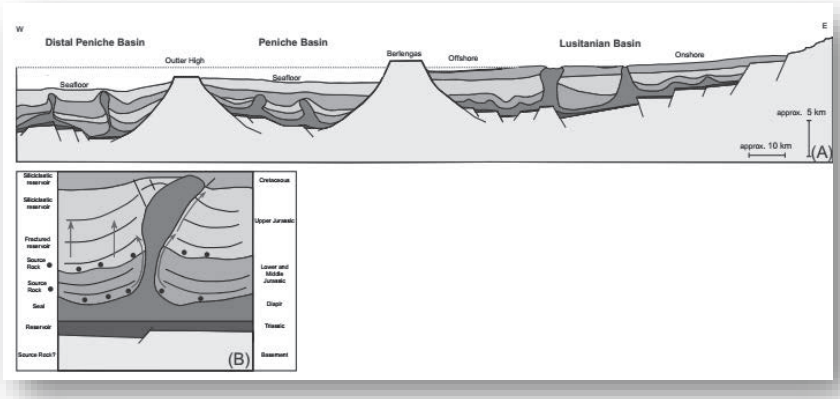
We also produce consulting reports in several projects in which geologic knowledge is a major support for decision making in organizations.

Results: A book chapter and several reports for oil companies and others.

Outputs:

Book chapter

1. R. Pena dos Reis, R.; Pimentel, N.; Fainstein, R.; Reis, M.; Rasmussen, B., 2017. Influence of Salt Diapirism on the Basin Architecture and Hydrocarbon Prospects of the Western Iberian Margin. In: J. I. Soto, J. F. Flynch and G. Tari (eds.), Permo-Triassic Salt Provinces of Europe, North Africa and the Atlantic Margins. Tectonics and hydrocarbon potential, *Elsevier*, Cap. 14, pp. 313-329.



Salt tectonics and petroleum systems at the Western Iberian Margin (from Pena dos Reis et al., 2017).

Reports

1. Working Plan of the Portfuel Aljezur concession. November and December, 2016.

2. Working Plan of the Portfuel Tavira concession. November and December, 2016.

3. Brisa Expertise Report; Pombal Justice Court. Process: 2382/14.8T8PBL 2016.

Coastal outcrop in the former Aljezur concession area (Portfuel Company).

Petroleum Systems of the Western Iberian Margin

Nuno Pimentel[1] and Rui Pena dos Reis[2]

(1) Instituto Dom Luiz, Faculty of Sciences of the University of Lisbon, Campo Grande C-6, 1749-016 Lisbon, Portugal; npimentel@fc.ul.pt

(2) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; penareis@dct.uc.pt

Project type: Field Trip of an International Congress: AAPG/SEG LONDON ICE 2017

Leaders: Nuno Pimentel and Rui Pena dos Reis

Coordination: Nuno Pimentel and Rui Pena dos Reis

Team: Nuno Pimentel e Rui Pena dos Reis and Gustavo Gonçalves Garcia

Institutions involved: Geosciences Center of the University of Coimbra and D. Luis Institute of the University of Lisbon.

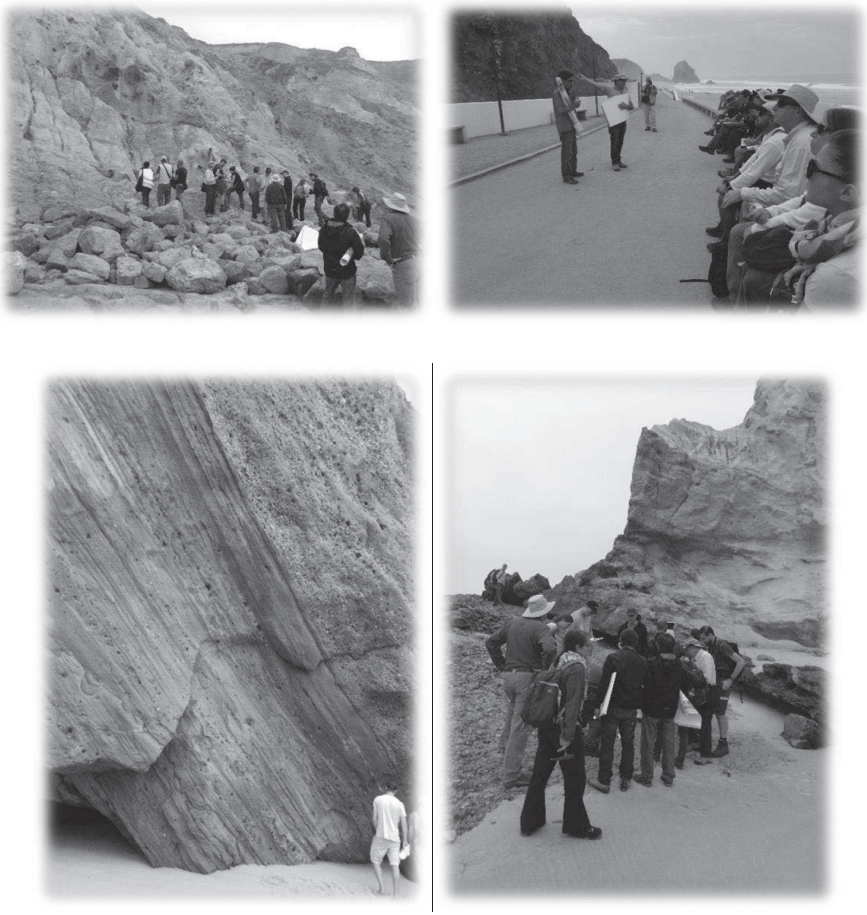
Goals: The visit intended to be a three-day field-trip looking at significant geologic features of the three major petroleum systems of the Lusitanian Basin, namely the Silurian black-shales and Triassic siliciclastic reservoirs, the Pliensbachian marine source rock and Lower Cretaceous siliciclastic reservoirs, and the Oxfordian lagoonal source rock and the Upper Jurassic carbonate and siliciclastic reservoirs.

Results: Thirteen professionals from different companies joined us for a visit based in large outcrop observations, mostly along coastal cliffs. Selected seismic lines, well data and geochemical analysis have also been shown and discussed. Geodynamic evolution, basin architecture and salt tectonics (including seismic scale piercing diapirs) have been presented. Overall, the attendees had the opportunity to approach different source rocks, reservoirs, seals and traps, as well as their spatial and time-relations, within a rift-to-drift framework.

Outputs:

Books

1. Pimentel, N.; Pena dos Reis, R., 2017. Petroleum Systems of the Western Iberian margin, Field Trip Guide AAPG-ICE, London 2017, 44 p. (online: https://www.researchgate.net/publication/320592482_Petroleum_Systems_of_the_Western_Iberian_margin_Field_Trip_Guide).



Field trip held between October 12th and 14th, 2017.

ISBN 978-989-96923-8-1

AAPG European Region Conference 2018, Lisbon, "Global Analogues for the Atlantic margins"

Rui Pena dos Reis[1], Nuno Pimentel[2] and Hugo Matias[3]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; penareis@dct.uc.pt

(2) Instituto Dom Luiz, Faculty of Sciences of the University of Lisbon, Campo Grande C-6, 1749-016 Lisbon, Portugal; npimentel@fc.ul.pt

(3) Repsol, Méndez Álvaro, 44 Madrid, Madrid 28045 Spain; hcrmatias@gmail.com

Project type: International Scientific Event

Leaders: Rui Pena dos Reis, Nuno Pimentel and Hugo Matias

Coordination: n/a

Team: Rui Pena dos Reis, Nuno Pimentel, Hugo Matias and Marta Diaz (secretary)

Institutions involved: Center of Geosciences of the University of Coimbra, Institute D. Luiz University of Lisbon and Repsol

Goals: Analogies are established by the recognition of similarities between objects or situations, defining the ambiguities, dissimilarities or false attributions that may weaken or break the analogy.

Parameters such as basin type, tectonic regime, structural setting and many others, are crucial for the definition of geologic situations as promising analogues.

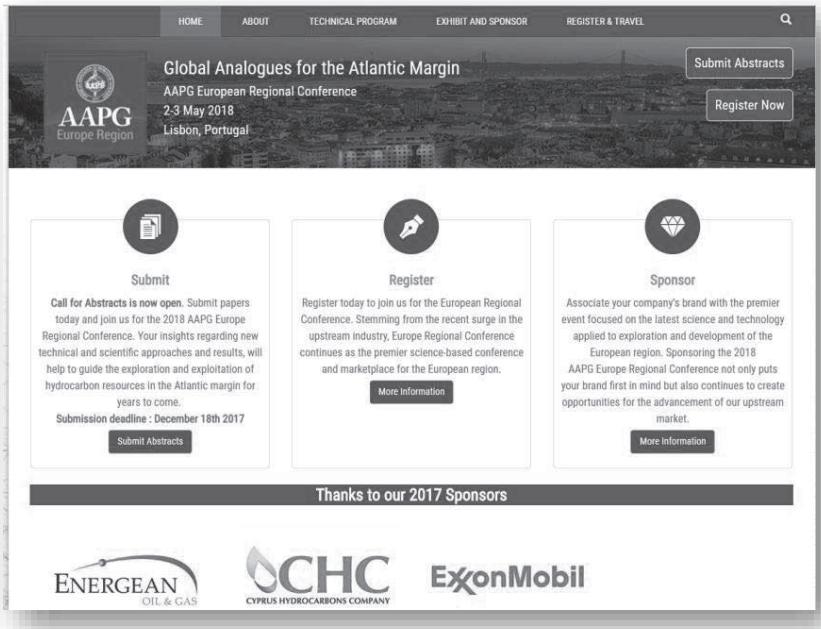
Analogues in outcrop or even in underwater basins, together with large amounts of acquired data, are a major tool for exploring new frontiers or even mature provinces.

This Conference aims to bring together oil industry exploration professionals and academic or independent researchers, in order to discuss how to approach the Atlantic Margins using global analogues.

Results: In progress.

Outputs:

In progress.



Topics

A. Geodynamic Framework

- Deep seismic profiles of Atlantic margins
- Basement influence – source-rock and tectonic control
- Magmatism, heat-flow variations and maturation
- From Rift to Drift

B. Regional Framework

- Paleogeography and Provenance influence on Source-rock and Reservoirs
- The influence of Alpine inversion – good or bad for Atlantic petroleum systems
- Atlantic exploration frontiers

C. Analogues

- Pre-salt issues and analogues
- Salt Tectonics and Petroleum Systems
- Outcrop analogues for reservoir modeling
- Unconventionals in Europe – analogues and perspectives

D. Technological Challenges

- Deepwater drilling and deep targets
- Seismic imaging
- Pore pressure: advances in data integration & modelling

Website of the AAPG European Region Conference 2018, Lisbon. "Global Analogues for the Atlantic margins" (http://erc.aapg.org/2018).

Geological Heritage and Geoconservation

Maria Helena Henriques[1] and Rui Pena dos Reis[1]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; hhenriq@dct.uc.pt; penareis@dct.uc.pt

Project type: Research and Innovation

Leaders: Maria Helena Henriques and Rui Pena dos Reis

Coordination: Maria Helena Henriques and Rui Pena dos Reis

Team: M. Helena Henriques, Rui Pena dos Reis, Artur Sá, Daniela Rocha, María Luisa Canales, Elizabeth Silva and Jorge Carvalho

Instituitions involved: Geosciences Center of the University of Coimbra, Arouca Geopark, UNESCO National Committee for the International Geosciences Programme and Portuguese National Commission for UNESCO

Goals: Inventorying, assessment, conservation a monitoring of geological objects with heritage value. Dissemination and validation of knowledge in specialized fóruns. Expertise for organizations dealing with geoconservation in Portugal and abroad.

Results:

Participation in the 14th European Geoparks Conference, Azores.

Peer revision of several articles submitted to journals.

Maria Helena Henriques is Guest co-editor of the Special Issue "Selected Papers from the 14th European Geoparks Conference" (2017), *Geosciences* journal (ISSN 2076-3263); online: http://www.mdpi.com/journal/geosciences/special_issues/14th_European_Geoparks_Conference).

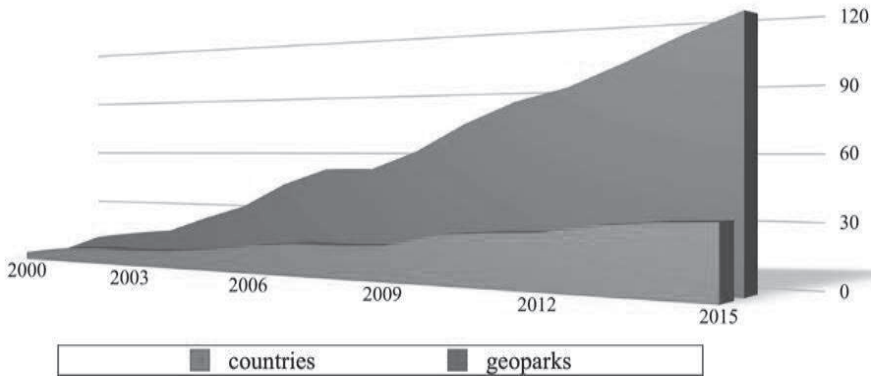
2017 – "Publons Peer Review Award", assigned to Maria Helena Henriques as "Top Reviewer" of the University of Coimbra".

Submission and publication of articles, book chapters and books.

Participation in the organization of events:

2017 – "14th European Geoparks Conference", Ponta Delgada (Azores, Portugal), Scientific Committee (http://www.egnazores2017.com/).

2017 – "XII Bienal de la Sociedad Española de Historia Natural", Coimbra (Portugal), Comissão Científica.



Evolution of the number of geoparks/countries in the European Geoparks Network (2000–2003 and in the Global GeoparksNetwork (2004–2017). Geoparks/countries that were excluded from the networks before 2017 were not included in the graph (from Henriques and Brilha, 2017).

Outputs:

Articles

1. Pena dos Reis, R.; Henriques, M. H., 2017. Geoheritage and advanced training for the oil industry: the Lusitanian Basin case-study (Portugal), *American Association of Petroleum Geologists Bulletin*, 41 p.; doi: 10.1306/10181717238.

2. Henriques, M. H.; Brilha, J., 2017. UNESCO Global Geoparks: a strategy towards global understanding and sustainability, *Episodes*, 40(4), pp. 349-355.

3. Henriques, M. H.; Canales, M. L.; García-Frank, A.; Gomez-Heras, M., 2018. Accessible geoparks of Iberia: a challenge to promote geotourism and education for sustainable development, *Geoheritage*, 32 p. (*under review*).

Communications

1. Henriques, M. H.; Brilha, J., 2017. UNESCO Global Geoparks as active partners to achieve global understanding goals, 14th European Geoparks Conference, Azores, Abstract Book, p. 162.

2. Henriques, M. H.; Pena dos Reis, R., 2017. Geoheritage and Advanced Training for the Oil Industry: the Lusitanian Basin case-study (Portugal), 14th European Geoparks Conference, Azores, Abstract Book, p. 73.

3. Rocha, D.; Neves, R.; Duarte, A.; Vilar, O.; Bernardo, V., 2017. Paiva walkways: an example of sustainable management in Arouca Unesco Global Geopark (Portugal), 14th European Geoparks Conference, Azores, Abstract Book, p. 25.

4. Page, K.; Carvalho, C. N.; Canudo, J. I.; Couto, M. H. M.; Henriques, M. H.; Hilario Orús, A.; Meléndez, G., 2017. Collecting fossils for research and education in Unesco Global Geoparks and other protected areas, 14th European Geoparks Conference, Azores, Abstract Book, p. 57.

5. Duarte, A.; Rocha, D., 2017. Geosites Route of Arouca Geopark: a geological-based touristic product in a geotourism destination, 14th European Geoparks Conference, Azores, Abstract Book, p. 116.

Front cover of the Abstracts Book of the 14th European Geoparks Conference, Azores (online: http://globalgeoparksnetwork.org/wp-content/uploads/2017/01/Abstracts.Book_.pdf).

6. Gómez - Heras, M.; Canales, M. L., González - Acebrón, L.; Muñoz - García, M. B.; Fesharaki, O.; Gonzalo, L.; García - Frank, A., 2017. Inclusive multisensorial activities for people with disabilities. A case study developed in the Basque Coast Geopark in Zumaya (North Spain), 14th European Geoparks Conference, Azores, Abstract Book, p. 135.

7. Ureta, M. S.; Canales, M. L., 2017. Influence of the Aalenian Global Stratotype Section and Point in the social development of the Molina region-Alto Tajo Geopark (Spain), 14th European Geoparks Conference, Azores, Abstract Book, p. 136.

8. Trincão, P.; Lopes, E.; Carvalho, J. ; Ataíde, S.; Perrollas, M., 2017. Beyond time and space - the Aspiring Jurassic Geopark of Figueira da Foz, 14th European Geoparks Conference, Azores, Abstract Book, p. 176.

The Guincho rock of Santa Cruz geosite (Lusitanian Basin, Central Portugal) composed of Upper Jurassic coarse siliciclastic sediments infilling a submarine incision channel (from Pena dos Reis and Henriques, 2017).

Public Understanding of Geosciences

Maria Helena Henriques[1] and Rui Pena dos Reis[1]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; hhenriq@dct.uc.pt; penareis@dct.uc.pt

Project type: Research and Innovation

Leaders: Maria Helena Henriques and Rui Pena dos Reis

Coordination: Maria Helena Henriques and Rui Pena dos Reis

Team: Maria Helena Henriques, Rui Pena dos Reis, Luiz Oosterbeek, Artur Sá, Patrícia João, André Cortesão and Elizabeth Silva

Institutions involved: Geosciences Center of the University of Coimbra, UNESCO National Committee for the International Geosciences Programme and Portuguese National Commission for UNESCO

Goals: Earth sciences and society: geosciences within the scientific cluster; geosciences for global understanding; geosciences for sustainable development.

Results: Participation in several meetings:

- Encontro com a Ciência e Tecnologia em Portugal, #Ciencia2017PT, Lisboa.

- Seminário Exploração Oil & Gas e Sustentabilidade at the Forum dos Oceanos; Associação da Economia do Mar; UPTEC - Pólo do Mar, Leça da Palmeira (Portugal).

- 2º ENJIE – Encontro Nacional de Jovens Investigadores em Educação, Universidade do Minho, Braga.

Organization of events:

- "IV CIECITEC - Congresso Internacional de Educação Cientifica e Tecnológica", Universidade Regional Integrada do Alto Uruguai e das Missões, Santo Ângelo, Rio Grande do Sul (Brasil), Comitê Cientifico.

- "XII Bienal de la Sociedad Española de Historia Natural", Coimbra (Portugal), Comissão Científica.

Peer revision of several articles submitted to journals.

Submission and publication of book chapters and books. Media interventions: "*Prós e Contras*" (RTP 1) *Expresso* and EGU Blogs

Outputs:

Books

1. Henriques, M. H., 2017. Cartas a um Pai Natal Ambiental, Coleção Descobrir as Ciências, *Imprensa da Universidade de Coimbra*, 22 p.

Book cover of "Cartas a um Pai Natal Ambiental" (from Henriques, 2017).

Book chapters

1. Henriques, M. H., 2017. "The Regional Action Centre of Mação/Coimbra (Portugal) of the International Year of Global Understanding: activities and achievements". In: L. Oosterbeek, R. Gudauskas & L. Caron (Eds.), "Education, training and communication in cultural management of landscapes. Transdisciplinary contributions for Cultural Integrated Landscape Management", Instituto Terra e Memória, série Arkeos, Mação, vol. 42, p. 47-53 (ISSN: 0873-593X; ISBN: 978-989-99131-4-1).

2. Pena dos Reis, P., 2016. Uso de combustibles fósiles y efecto envernadero. In: A. Corrochano Sánchez (Coord.), "Cambios climáticos. Causas y variabilidade desde una perspectiva geológica", *Centro de Estudios Salmantinos*, Salamanca, pp. 111-124.

The website of the Regional Action Centre of Mação-Coimbra of the International Year of Global Understanding (www.entendimentoglobal.ipt.pt; from Henriques, 2017).

The representation of the main vision and communication strategy of the International Year of Global Understanding in the stamps, highlighting the major role assigned to the Regional Action Centers as regional and national identity entities of the initiative (from Henriques, 2017, in press).

Angular unconformity at Telheiro Beach (Algarve, Portugal; from Cortesão, 2017).

Communications

1. João, P.; Rodrigues, A. P.; Henriques, M. H., 2017. Ensinar ciências ao longo do ensino básico: desenvolvimento sustentável e atividades práticas sobre solos, 2º ENJIE – Encontro Nacional de Jovens Investigadores em Educação, Universidade do Minho, Braga, 5 p.

2. Henriques, M. H.; Pena dos Reis, R., 2017. Gestão de Territórios e Desenvolvimento Social: Geoconservação - da doutrina à valorização social", Encontro com a Ciência e Tecnologia em Portugal, #Ciencia2017PT, Lisboa, (online: http://www.encontrociencia.pt/programa/detalhesprograma/?dia=3).

3. Cortesão, A., 2017. Imaggeo on Mondays: Angular unconformity. GeoLog EGU Blogs, the official blog of the European Geosciences Union (online: https://blogs.egu.eu/geolog/).

The Latin America and Caribbean UNESCO Global Geoparks framework: diagnosis and proposals towards its development and improvement, and their contribution to Agenda 2030

Emmaline Montserrat Rosado González [1, 2, 3], Artur Agostinho de Abreu e Sá [1, 2] and José Luis Palacio Prieto [3]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; emma.rogz@gmail.com; asa@utad.pt

(2) University Trás-os-Montes e Alto Douro, Quinta de Prados, 5000-801 Vila Real, Portugal;

(3) UNAM - National Autonomous University of Mexico, Institute of Geography Av Universidad 3000, Investigación Científica, Cd. Universitaria, 04510 Ciudad de México CDMX, México; palacio@unam.mx

Project type: PhD Geology of the University Trás-os-Montes e Alto Douro (Portugal)

Leader: Emmaline Montserrat Rosado González

Coordination: Artur Agostinho de Abreu e Sá and José Luis Palacio Prieto

Team: Emmaline Montserrat Rosado González (University of Trás-os-Montes e Alto Douro, Portugal), Artur Agostinho de Abreu e Sá (University of Trás-os-Montes e Alto Douro, Portugal) and José Luis Palacio Prieto (National Autonomous University of Mexico)

Institutions involved: University of Trás-os-Montes e Alto Douro, Portugal (Portugal) and National Autonomous University of Mexico (Mexico)

Goals: The UNESCO Global Geoparks (UGG) is one of the most recent and innovative initiatives to promote sustainable development based on a holistic approach, considering education, local development, scientific research, protection and promotion of natural and cultural heritage.

Although UGG are distributed throughout five continents, it's an evidence that they are presently concentrated in Europe and Eastern Asia (China and Japan). In this framework Latin America and Caribbean (LAC) is an emerging region regarding UGG topics, with a particular social, political and cultural challenges. In this sense, it is important to identify, analyze and discuss the main factors facing the creation and development of new UGG projects in this continental region.

By the other hand, it is assumed that UGG territories may be relevant contributors to reach the Agenda 2030 Sustainable Development Goals (SDGs). For this reason, the main objective of this

research is to develop a set of working tools to contribute for the establishment and improvement of new UGG in Latin America and Caribbean, under the framework of the Agenda 2030 SDGs. In this sense, the development and implementation of accurate Management Plans is one of the main weaknesses commonly referred about the issues regarding the difficulties to implement UGG in LAC. Other problematic subject is related with the UGG evaluation questionnaires, clearly adequate for a European socio-economic context but not completely suitable for LAC countries.

In this context, is herein presented a new proposal for a regional evaluation questionnaire, in accordance with the basic UNESCO evaluation criteria, and a friendly territorial management tool (Action Planning Guide) that intends to allow a easier preparation and implementation of this key-management document for UGG.

The present work is focus on the analysis of the LAC framework characteristics, issues and potentials for the establishment of UGG and also on their potential to contribute effectively for SDGs. In order to better understand this problematic, it will be realize a systematic study and diagnostic trough a SWOT analysis and questionnaires about the facing realities by the LAC UGG and aspiring territories therein. With this methodology is expected to obtain a data set in order to develop an Action Plan Guide and the proposal of a new evaluation form/tools adapted to the LAC realities, considering the UGG guidelines and objectives and SDGs targets.

Results: Through the analysis and discussion of the LAC reality, problems, circumstances and potentials, it will be developed in this work an Action Plan Guide in order to create a worthwhile tool on capacity building with the aim to contribute for the development of UGG in LAC countries, being aware that this reality can contribute to achieve SDGs.

The creation of this Action Plan Guide will help to reduce the current ongoing bad practices on the creation of UGG in LAC that have been developing in the last years. These unsuccessful initiatives are currently attributed to the lack of knowledge regarding the UGG guidelines, many time reinforced by the spontaneous appearance of self-proclaimed experts who profit damagingly with the misuse of the Geoparks concept.

Furthermore, taking into account the present LAC framework towards the development of Geoparks it will be also designed a proposal of a new evaluation form, adapted to LAC realities, adjusted to the real natural, cultural, social and economic values of this continental region, without ever neglecting the UGG guidelines. In this sense, it is important to underline that the current evaluation form was created for a European context that when it is applied to LAC territories it creates several difficulties in understanding the truly potential of the territories, mainly about its socio-economic and cultural realities.

According to this, the main input expected with this work will be the development of helpful tools that can contribute for the creation and affirmation of UGG in LAC region under the SDG´s framework, promoting examples of good practices.

Outputs:

Communications

1. Rosado-González, E. M., 2017.Tequio-type indigenous management of geoheritage in Mixteca Alta Aspiring Geopark, Managing Mediterranean Moutain Geoheritage Conference, Manteigas, Portugal, Abstract Book, p. 40.

2. Rosado-González, E.; Sá, A.; Palacio-Prieto, J. L.; Silva, E., 2017. " All different, all equal": Why it is so difficult to develop new UNESCO Global Geoparks in Latin America and Caribbean countries? The example of the Mixteca Alta UNESCO Global Geopark. 14th European Geoparks Conference, Azores, Abstract Book, p. 162.

3. Sá, A.; Silva, E.; Rosado-González, E.; Melo, P.; Palacio-Prieto, J. L., 2017. Contribution for the discussion and new approaches about the development of UNESCO Global Geoparks in Latin America and the Caribbean. 14th European Geoparks Conference, Azores, Abstract Book, p. 162.

The logo of the Mixteca Alta UNESCO Geopark.

Mixteca Alta UNESCO Global Geopark, Oaxaca, Mexico.

The contribution of the European UNESCO Global Geoparks for the Agenda 2030 for Sustainable Development – a study based on progress reports covering the period 2012-2016

Elizabeth Maria Rocha da Silva[1,2], Maria José Roxo[2] and Artur Agostinho de Abreu e Sá[1, 3]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; ardi_eu@hotmail.com; asa@utad.pt

(2) School of Social Sciences and Humanities of the Nova University of Lisbon; mj.roxo@fcsh.unl.pt

(3) University Trás-os-Montes e Alto Douro, Quinta de Prados, 5000-801 Vila Real, Portugal.

Project type: PhD in Geography and Territorial Planning, NOVA School of Social Sciences and Humanities of the Nova University of Lisbon

Leader: Elizabeth Maria Rocha da Silva

Coordination: Maria José Roxo and Artur Agostinho de Abreu e Sá

Team: Elizabeth Maria Rocha da Silva (NOVA School of Social Sciences and Humanities of the Nova University of Lisbon, Portugal), Maria José Roxo (School of Social Sciences and Humanities of the Nova University of Lisbon) and Artur Agostinho de Abreu e Sá (University Trás-os-Montes e Alto Douro, Portugal)

Institutions involved: NOVA School of Social Sciences and Humanities of the Nova University of Lisbon, Portugal and University of Trás-os-Montes e Alto Douro, Portugal

G**oals:** With the approval of the International Geosciences and Geoparks Programme by Member States of UNESCO, in November 2015, during the 38th Session of the General Conference of UNESCO, 120 territories across 33 countries became UNESCO Global Geoparks (UGG). Focused on the four pillars of UNESCO – Education, Science, Culture and Communication – the work carried out by the UGG has been based on a territorial development process essentially bottom-up type and on a rigorous evaluation criteria. In this sense, it is given particular emphasis to the development of educational programs and cultural initiatives, scientific research and geotouristic activities, which are expected to contribute to the creation of vibrant regions, where the sense of territorial ownership of its inhabitants can be added to the creation of local companies and innovative local products, contributing for a real sustainable regional development. In this context, this research study will be developed in the framework of the Agenda 2030 for Sustainable Development based on the analysis of the contents of the European

UGG progress reports through a sample of 32 European UGG, in 22 European countries, for the 2012-2016 time frame.

The UGG due to their definition, commitments and activities are key actors in the development of strategies and policies towards a sustainable regional development. In this sense, taking into account the five pillars that are the foundation of the Agenda 2030 – People, Planet, Prosperity, Peace and Partnership –, together with the 17 Sustainable Development Goals and also aligned with the Top 10 topics within UGG, this research study will be focused on two main issues: how do the European UGG members effectively contribute to the achievement of the three referred key components concerning a sustainable future, and how can these contributions be quantified and used as good practices examples, in order to demonstrate the real impact of the European UGG actions towards ending poverty, protecting the planet and ensuring prosperity for all. This research study can also bring new inputs for the future action and strategic plans to be developed by the UGG management structures and helping them to measuring future contributions for each Sustainable Development Goal (SDGs) of the Agenda 2030.

Results: The results obtained with the data analysis of the chosen sample will be submitted to a deeper statistical examination, which will take into account different indicators such as the different European countries of the UGG, geographical region where they are located, population densities of each territory, the contribution for each SGDs, for each Top 10 Topics and for each 5Ps of the Agenda 2030, among others.

The discussion of the results will have as main focus the contribution of each sampled European UGG, in terms of country/ geographical area, for the achievement of the SGDs. In this way, it is intended to contribute to an effective knowledge, by significant sample, about the contribution of European UGG to achieve the SGDs. It will also be presented the main limitations that were found during the data analysis and their implications.

With this research study it is intended to establish a new knowledge about the importance and impact of the initiatives developed by the European UGG, in the field of Sustainable Development. It is also expected that this research study bring a new light to the compromises of the UGG towards the UNESCO priorities and strategies, assuming their role as a UNESCO designation.

Outputs:

Communications

1. Gabriel, R.; Moreira, H.; Faria, A.; Silva, E.; Sá A., 2017. An emerging paradigm for the UNESCO Global Geoparks: the ecosystem's health provision. 14th European Geoparks Conference, Azores, Abstract Book, p. 162.

2. Rosado-González, E.; Sá, A.; Palacio-Prieto, J. L.; Silva, E., 2017. "All different, all equal": Why it is so difficult to develop new UNESCO Global Geoparks in latin america and caribbean countries? The example of the Mixteca Alta UNESCO Global Geopark. 14th European Geoparks Conference, Azores, Abstract Book, p. 162.

3. Sá, A.; Silva, E.; Rosado-González, E.; Melo, P.; Palacio-Prieto, J. L., 2017. Contribution for the discussion and new approaches about the development of UNESCO Global Geoparks in Latin America and the Caribbean. 14th European Geoparks Conference, Azores, Abstract Book, p. 162.

4. Silva, E., 2017. The Agenda 2030 of the United Nations for Sustainable Development: UNESCO Global Geoparks key-actors in its implementation of the 17 SDG's in these territories. Brazil.

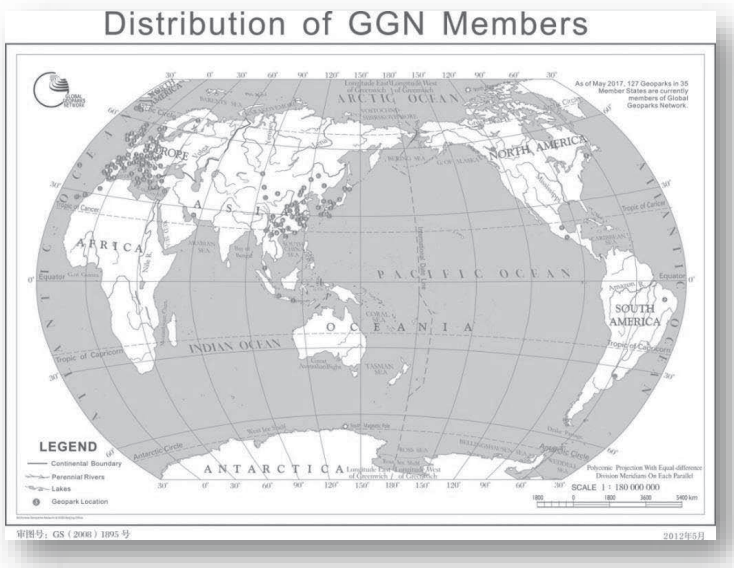
Location of the 70 Geoparks from 23 European Countries which integrate the European geoparks Network (online: http://www.europeangeoparks.org/?page_id=168).

5. Silva, E., 2017. UNESCO Global Geoparks and the Agenda 2030: The importance of the 17 SDG's in the work done in these territories, Managing Mediterranean Moutain Geoheritage Conference, Manteigas, Portugal, Abstract Book, p. 40.

6. Silva, E. Castro, E.; Fernandes, M.; Firmino, G.; Gomes, H.; Loureiro, F.; Patrocínio, F.; Vieira, G.; Sá, A., 2017. The role of the portuguese Forum of UNESCO Global Geoparks regarding new candidatures: the case of the Aspiring Geopark Estrela. 14th European Geoparks Conference, Azores, Abstract Book, p. 162.

7. Silva, E.; Roxo, M.; Sá, A., 2017. The contribution of the european unesco global geoparks for the Agenda 2030 for sustainable development: a preliminary approach. 14th European Geoparks Conference, Azores, Abstract Book, p. 162.

8. Silva, E.; Sá, A., 2017. Geoethics as indispensable tool for GGN in the context of the agenda 2030 for sustainable development. 14th European Geoparks Conference, Azores, Abstract Book, p. 162.



Distribution of geoparks which integrate the Global Geoparks Network (online: http://www.globalgeopark.org/UploadFiles/2012_5_7/GGN%20Map%202017/GGN%20Distribution%202017.05.08%20-%20no%20national%20boundary%20-%203600.jpg).

Trilobites of the Upper Ordovician from the Portuguese Central Iberian Zone

Sofia Raquel Cardoso Pereira [1,2], Carlos Alberto Pires Fernandes Marques da Silva[2] and Artur Agostinho de Abreu e Sá [1, 3]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; ardi_eu@hotmail.com; asa@utad.pt

(2) Faculty of Sciences of the University of Lisbon, Campo Grande 1749-016 Lisboa Portugal; cmsilva@ciencias.ulisboa.pt

(3) University Trás-os-Montes e Alto Douro, Quinta de Prados, 5000-801 Vila Real, Portugal;

Project type: PhD in Geology, Specialization in Palaeontology & Stratigraphy, Faculty of Sciences of the University of Lisbon

Leader: Sofia Raquel Cardoso Pereira

Coordination: Carlos Alberto Pires Fernandes Marques da Silva and Artur Agostinho de Abreu e Sá

Team: Sofia Raquel Cardoso Pereira (Faculty of Sciences of the University of Lisbon), Carlos Alberto Pires Fernandes Marques da Silva (Faculty of Sciences of the University of Lisbon) and Artur Agostinho de Abreu e Sá (University of Trás-os-Montes e Alto Douro)

Institutions involved: University of Trás-os-Montes e Alto Douro (Portugal) and Faculty of Sciences of the University of Lisbon (Portugal)

Goals: Trilobite fossils from the Upper Ordovician of the Portuguese Central Iberian Zone (CIZ) are known for more than 150 years, since the pioneer works of Nery Delgado. Despite being the subject of occasional research works, the vast fossil collections of Portuguese Upper Ordovician trilobites present in museums in Portugal and abroad lacked comprehensive study and revision.

The main aim of this work is the palaeontological study of the trilobite assemblages from the Portuguese CIZ. It starts with the critical analysis of the published data, the inventory of the classical stratigraphical collections and the gathering of new data that allowed the individualization of 12 different geological-geographical regions where Upper Ordovician sequences are represented: the Buçaco Syncline, Fajão-Moradal Syncline, Amêndoa-Carvoeiro Syncline, Vila Velha de Rodão Syncline, Penha Garcia Syncline, Marofa, Portalegre Syncline, Valongo Anticline, Arouca-Castro Daire Syncline, Covelas-Viana do Castelo Belt, Marão-Alvão structure and Trás-os-Montes. The State of the Art for these sequences was made, new lithostratigraphic data was added

and the lithostratigraphical nomenclature was homogenized.

Results: The palaeoecological study allowed characterizing eight trilobite biofacies, being these correlated with assemblages and communities documented by other authors. A palaeoenvironmental distribution model for the original communities represented by these biofacies was presented. It was recognized an essentially siliciclastic platform during the Berounian and the Hirnantian, and a mixed to carbonate platform in the Kralodvorian. Sheltered preservation of Eoharpes macaoensis inside orthoconic nautiloid shells was documented and the term "occupism" was proposed to describe the cryptic behaviour of these organisms. Several moulting configurations are documented from the Portuguese Upper Ordovician, allowing to discuss the variability of moulting mechanisms and the functionality of the ecdysial sutures.

From a biostratigraphical standpoint, a five-horizon scheme was proposed, covering most of the Upper Ordovician sequence, providing local and regional correlation in the Ibero-Armorican area. These horizons were correlated to the trilobite biozones previously defined in this region. The data allowed to update the Ibero-Armorican trilobite biozonal scheme, being proposed the replacement of the *Cekovia perplexa* Biozone by *Cekovia perplexa-Parillaenus? creber* assemblage Biozone, the exclusion of the "*Stenopareia*" cf. *oblit* sub-Biozone and the replacement of the *Holdenia insculpta* sub-Biozone by the *Holdenia insculpta-Phillipsinella lusitanica* assemblage sub-Biozone. Additionally, a *Eudolatites-Dalmanittina* interval Biozone was suggested, restricted to the Berounian, being useful for the definition of the lower and upper boundaries of this regional stage in the High Latitude Province. It is also reported for the first time in Portugal assemblages of the Foliomena and the Hirnantia faunas.

From a palaeobiogeographical point of view, the trilobites from the Upper Ordovician of the Portuguese CIZ belong to the Trilobite High Latitude Province, which has an endemic character until the late Berounian. The high biodiversity here reported for the Berounian assemblage (more than 20 species), dismisses its previously assumed low diversity, interpreted as the result of the subpolar setting of Ibero-Armorican domain. For the Kralodvorian, several faunal shifts in opposite direction to the ones usually described during the Boda Event are reported. Thus, it is suggested that the global decrease in endemism that characterized upper Katian times was related not only to the arrival of lower-latitud taxa to the High Latitude Province, but also to the expansion of the geographical distribution of endemic genera from this last province, some of which became cosmopolite and common in the low-diversity and opportunistic faunas reflected in the fossil assemblages that characterize Hirnantian deposits.

Outputs:

Articles

1. Colmenar, J.; Pereira, S.; Pires, M.; Silva, C. M.; Young, T., 2017. A Kralodvorian (upper Katian, Upper Ordovician) benthic association from the Ferradosa Formation (central Portugal) and its significance for the redefinition and subdivision of the Kralodvorian stage. *Bulletin of Geosciences* (*in press*).

2. Colmenar, J.; Pereira, S.; Sá, A. A.; Silva, C. M.; Young, T., 2017. The highest-latitude Foliomena Fauna (Upper Ordovician, Portugal) and its palaeogeographical and palaeoecological significance. *Palaeogeography, Palaeoclimatology, Palaeoecology*, 485, 774-783 (*in press*).

3. Pereira, S.; Silva, C. M.; Sá, A. A.; Pires, M.; Marques Guedes, A.; Budil, P.; Laibl, L.; Rabano, I., 2017. The illaenid trilobites Vysocania and Octillaenus from the Upper Ordovician of the Czech Republic, Portugal, Spain and Morocco. *Bulletin of Geosciences* (*under review*).

Communications

1. Colmenar, J.; Pereira, S., 2017. Evolución de las comunidades bentónicas de braquiópodos en el Ordovícico Superior de Portugal. XV EJIP, Pombal, Portugal.

2. Pereira, S.; Colmenar, J.; Sá, A. A; Pires, M.; Silva, C. M., 2017. A associação macrofossilífera da Formação Ribeira da Laje (Berouniano superior, Portugal): as últimas comunidades endémicas ordovícicas peri-gondwânicas. XV EJIP, Pombal, Portugal.

3. Pereira, S.; Holloway, D. J.; Adrain, J. M.; Silva, C. M.; Sá, A. A., 2017. Panderiidae and Hemibarrandiidae (Trilobita): their affinities with Nileidae. 6th International Conference on Trilobites and their Relatives, Tallinn, Estonia.

PhD Thesis

Pereira, S., 2017. Trilobites do Ordovícico Superior da Zona Centro-Ibérica portuguesa. PhD thesis, Universdade de Lisboa, 714 pp.+123 plates.

6th International Conference on Trilobites and their Relatives, Tallinn, Estonia.

UNESCO chair on geoparks, sustainable regional development and healthy lifestyles

Artur Abreu e Sá[1, 2], Elizabeth Maria Rocha da Silva[1], Ronaldo Gabriel[2], Artur Cristóvão[2] and Helena Moreira[2]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; asa@utad.pt; elizabeth.silva@mne.pt

(2) University of Trás-os-Montes e Alto Douro, Quinta de Prados, 5000-801 Vila Real, Portugal; rgabriel@utad.pt; hmoreira@utad.pt; acristov@utad.pt

Project type: Research, Teaching and Training

Leader: Artur Abreu e Sá (Chair holder)

Coordination: Artur Abreu e Sá, Elizabeth Silva, Ronaldo Gabriel, Artur Cristóvão and Helena Moreira

Team: Artur Abreu e Sá, Elizabeth Silva, Ronaldo Gabriel, Artur Cristóvão and Helena Moreira

Instituitions involved: University of Trás-os-Montes e Alto Douro (Portugal), Agostinho Neto University (Angola), Nacional de Tucuman University (Argentina), Federal University of Pernambuco (Brazil), Regional University of Cariri (Brazil), Atacama University (Chile), Amazónica Regional University (Ecuador), National Autonomous University of Mexico (Mexico), Autonomous University of San Luis Potosi (Mexico), Eduardo Mondelane University (Mozambique), University Complutense of Madrid (Spain), Geoscience Centre of the University of Coimbra (Portugal), Centre for the Research and Technology of Agro-Environment and Biological Sciences (Portugal), Centro de Estudos Transdisciplinares para o Desenvolvimento (Portugal), Portuguese National Commission for UNESCO, Regional Office for Eastern Africa for UNESCO, Regional Bureau for Sciences in Latin America and the Caribbean for UNESCO, Fundação António Manuel da Mota (Portugal) and Fundação Millenniun BCP (Portugal)

Goals: Launched in 1992, the UNITWIN/UNESCO Chairs Programme promotes international inter-university cooperation and networking to enhance institutional capacities through knowledge sharing and collaborative work.

The Programme supports the establishment of UNESCO Chairs and UNITWIN Networks in key priority areas related to UNESCO's fields of competence – i.e. in education, the natural and social sciences, culture and communication.

Through this network, higher education and research institutions all over the globe pool their resources, both human and material, to address pressing challenges and contribute to the development of their societies. In many instances, the Networks and Chairs serve as think tanks and as bridge builders between academia, civil society, local communities, research and policy-making. They have proven useful in informing policy decisions, establishing new teaching initiatives, generating innovation through research and contributing to the enrichment of existing university programmes while promoting cultural diversity. In areas suffering from a dearth of expertise, Chairs and Networks have evolved into poles of excellence and innovation at the regional or sub-regional levels. They also contribute to strengthening North-South-South cooperation.

Today, the Programme involves over 700 institutions in 116 countries.

The UNESCO Chair on Geoparks Sustainable Regional Development and Healthy Lifestyles:

https://unescochairutad.wordpress.com/

gives the auspicies for research work developed on the Chair topics in the following Master and Doctorate courses in the University of Trás-os-Montes e Alto Douro.

Also this Chair offers:

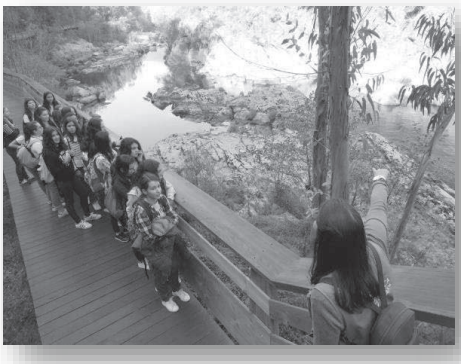
Short courses for members of institutions active in the field of territorial management, for officials and employees of the various ministries as well as for state organizations among others;

Support teaching and awareness programs on related topics.

Results:

The 1st International Summer University on Geoparks, Sustainable Regional Development and Healthy Lifestyles has been created within these three topics, based in a new and multidisciplinary approach towards capacity building on these subjects. As educational offer hosted in the University of Trás-os-Montes e Alto Douro (Vila Real, Portugal), this advanced educational and vocational training includes an intensive series of seminars and workshops during two weeks

With this International Summer University it is intended that participants can experience an innovative practice in which they can confront the theoretical knowledge with concrete realities and good practices in the management of the territories and in the implementation of diverse initiatives, particularly those with local communities' engagement.



Activities developed during the 1st International Summer University on Geoparks, Sustainable Regional Development and Healthy Lifestyles held at the University of Trás-os-Montes e Alto Douro (Vila Real, Portugal).

Outputs:

Communications

1. Gabriel, R.; Moreira, H.; Faria, A.; Silva, E.; Sá A., 2017. An emerging paradigm for the UNESCO Global Geoparks: the ecosystem's health provision. 14th European Geoparks Conference, Azores, Abstract Book, p. 162.

2. Guimarães, E.; Sá, A.; Gabriel, R.; Moreira, M. H.; Melo, J. P., 2017. Araripe UNESCO Global Geopark: matrix of priorities of the visitation impactmanagement plan with a focus on geotourism and the geoconservation of landresources. 14th European Geoparks Conference, Azores, Abstract Book, p. 162.

3. Rosado-González, E., 2017. Tequio-type indigenous management of geoheritage in Mixteca Alta Aspiring Geopark. Managing Mediterranean Moutain Geoheritage Conference, Manteigas, Portugal, Abstract Book, p. 40.

4. Rosado-González, E.; Sá, A.; Palacio-Prieto, J. L.; Silva, E., 2017. "ALL DIFFERENT, ALL EQUAL": Why it is so difficult to develop new UNESCO Global Geoparks in latin america and caribbean countries? The example of the Mixteca Alta UNESCO Global Geopark. 14th European Geoparks Conference, Azores, Abstract Book, p. 162.

5. Sá, A. A., 2017. The UNESCO Global Geoparks as tool to increase and promote the territorial identity. Managing Mediterranean Moutain Geoheritage Conference, Manteigas, Portugal, Abstract Book, p. 40.

6. Sá, A.; Barriuso, L.; Bourdoulous, J.; Costa, M. P.; Doyle, E., 2017. Interreg "Atlantic Geoparks": a transnational project for the promotion and cooperation of UNESCO Global Geoparks in the european atlantic área. 14th European Geoparks Conference, Azores, Abstract Book, p. 162.

7. Sá, A.; Silva, E.; Rosado-González, E.; Melo, P.; Palacio-Prieto, J. L., 2017. Contribution for the discussion and new approaches about the development of UNESCO Global Geoparks in Latin America and the Caribbean. 14th European Geoparks Conference, Azores, Abstract Book, p. 162.

8. Silva, E.; Sá A., 2017. Geoethics as indispensable tool for GGN in the context of the agenda 2030 for sustainable development. 14th European Geoparks Conference, Azores, Abstract Book, p. 162.

International Summer University on Geoparks, Sustainable Regional Development and Healthy Lifestyles

Artur Abreu e Sá[1, 2], Elizabeth Maria Rocha da Silva[1], Ronaldo Gabriel[2], Artur Cristóvão[2] and Helena Moreira[2]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; asa@utad.pt; elizabeth.silva@mne.pt

(2) University Trás-os-Montes e Alto Douro, Quinta de Prados, 5000-801 Vila Real, Portugal; rgabriel@utad.pt; hmoreira@utad.pt; acristov@utad.pt

Project type: Teaching and Training

Leader: Artur Abreu e Sá (Chair holder)

Coordination: Artur Abreu e Sá, Elizabeth Silva, Ronaldo Gabriel, Artur Cristóvão and Helena Moreira

Team: Artur Abreu e Sá, Elizabeth Silva, Ronaldo Gabriel, Artur Cristóvão and Helena Moreira

Instituitions involved: University of Trás-os-Montes e Alto Douro (Portugal)

Goals: The International Summer University on Geoparks, Sustainable Regional Development and Healthy Lifestyles has been created within these three topics, based in a new and multidisciplinary approach towards capacity building on these subjects. As educational offer hosted in the University of Trás-os-Montes e Alto Douro (Vila Real, Portugal), this advanced educational and vocational training includes an intensive series of seminars and workshops during two weeks (see Program https://unescochairutad.wordpress.com/program/). This broad-spectrum educational initiative will be complemented with a strong practice component through mid-course field trips to Arouca UNESCO Global Geopark, Terras de Cavaleiros UNESCO Global Geopark, Alto Douro Wine Region (World Heritage Site), Prehistoric Rock Art Site in the Côa Valley (World Heritage Site), Meseta Iberica Transboundary Biosphere Reserve, Bisalhães black pottery manufacturing process – UNESCO Intangible Heritage, Natural Park of International Douro and Azibo reservoir protected landscape.

With this International Summer University it is intended that participants can experience an innovative practice in which they can confront the theoretical knowledge with concrete realities and good practices in the management of the territories and in the implementation of diverse initiatives, particularly those with local communities' engagement.

This Summer University its evaluated with 6 ECTS.

Objectives:

Provide a broadband training course for students, researchers, managers, staff members and civil servants, among others, on Geoparks, Sustainable Regional Development and Healthy Lifestyles;

Create awareness about the Agenda 2030 for Sustainable Development and its 17 Goals and how these can be implemented and developed by the UNESCO territories;

Discuss the social relevance of the Top 10 topics within UNESCO Global Geoparks;

Share and review critically a set of examples about Education, Science and Culture initiatives developed in the UNESCO territories;

Impart knowledge, know-how and experiences on UNESCO territories management and touristic promotion;

Debate future perspectives for the development and affirmation of UNESCO territories.

Due to the strategic location of the city of Vila Real, in the heart of the Alto Douro Wine Region (WHS), it will be possible to offer to the participants of this International Summer University a diverse set of cultural, sports and recreation activities that will allow them to enjoy a unique training experience.

Results: The 1st International Summer University on Geoparks, Sustainable Regional Development and Healthy Lifestyles has been created within these three topics, based in a new and multidisciplinary approach towards capacity building on these subjects. As educational offer hosted in the University of Trás-os-Montes e Alto Douro (Vila Real, Portugal), this advanced educational and vocational training includes an intensive series of seminars and workshops during two weeks (3rd – 14th July 2017).

The 1st International Summer University on Geoparks, Sustainable Regional Development and Healthy Lifestyles.

SECTION 2
GEOTECHNOLOGY

The development of knowledge and competencies to find, characterize, process and use the geological materials (soil, rock, raw materials and water), the stone heritage and the environment are fundamental for the development and success of societies being certainly one of our most important challenges for the future. These issues are extremely important, even critical, since the available resources are limited and a wise utilization, consumption reduction and recycling must be achieved to promote the balance between nature, the societies and the individuals. The evaluation and mitigation of geological risks associated with the use of the geological environment is fundamental due to the crescent human disruption with the natural systems, the land occupation, the construction activities and the modulation of the earth surface performed by humans.

The Geotechnology group activities are based on a strong relation between geosciences research and the knowledge transference to engineering and society. The core research is focused on engineering geology, geotechnics and mining, seeking to improve the engineering procedures efficiency and the outputs, considering circular economy as a major research subject. The recycling of the geological materials and resources, the reduction of waste, the recovery of raw materials from used ones are focused in the group research activities.

The research developed by the Geotechnology group seek to investigate engineering solutions for problems of the construction and mining industries, and to promote those solutions with an emphasis on good environmental and sustainable practices. Engineering applications of geosciences include: the use of geological materials in civil engineering works; reuse of wastes from the construction and extraction industries; conservation and rehabilitation of stone heritage; slope stability assessments and geomechanics of slopes; geotechnical properties of soft rocks; geological and geotechnical surveying for better management and ordinance; geophysical prospecting applied to engineering, archaeology, groundwater resources; building foundations assessment; environmental assessment and remediation; mineral prospecting methodologies and procedures; application of flotation to the separation of urban wastes in particular plastics and metals.

Collaboration with researchers and institutions from the PALOPs, namely with Angola, East-Timor and Mozambique, but also with Spain is being done. A significant part of the research developed in Portugal is performed in cooperation with private companies and institutions dealing with the geological materials and the environment.

Mário Quinta Ferreira

CLIMRisk: climate change adaptation measures in the management of natural and environmental risks

Cristina Andrade[1] Anabela Veiga[2,6], Luis Santos[1,6], Luis Quinta-Nova[3], Maria João Bom[1], Nuno Pedro[3], Paulo Fernandez[3], Rita Anastácio[1], Sandra Mourato[2], Nuno Touret[4] and Pedro Mendes[5]

(1)Polytechnic Institute of Tomar, Natural Hazards Research Center (NHRC.ipt), Portugal

(2)Polytechnic Institute of Leiria, Portugal

(3) Polytechnic Institute of Castelo Branco, Portugal

(4) Câmara Municipal de Ourém, Gabinete de Proteção Civil, Portugal

(5) Câmara Municipal de Ferreira do Zêzere, Gabinete de Proteção Civil, Portugal

(6) Geosciences Centre of the University of Coimbra, Portugal

Project type: R&D, European Investment Funds by FEDER/COMPETE/POCI Operational Competitiveness and Internalization Program, under POCentro-PT2020-FEDER project Centro-01-0145-FEDER-024253. Project Span: Start - September 2017: Finalized: July 2019

Institutions involved: Polytechnic Institute of Tomar, Polytechnic Institute of Leiria, Polytechnic Institute of Castelo Branco, Câmara Municipal de Ourém, Câmara Municipal de Ferreira do Zêzere, Associated Research Centres: Geosciences Centre of the University of Coimbra

Leaders: Environment - Luís Santos, Climate, Cristina Andrade and Sandra Mourato; Coastal Erosion: Anabela Veiga; Forestry: Paulo Fernandez; GIS: Rita Anastácio

Coordination: Cristina Andrade

Team: Cristina Andrade, Sandra Mourato, Anabela Veiga Luis Santos, Luis Quinta-Nova, Maria João Bom, Nuno Pedro, Paulo Fernandez, Rita Anastácio, Nuno Touret and Pedro Mendes.

Goals: The main goals involve Environment and Natural Hazards in general. Particularly the project will evaluate natural and environmental risks from inland forests, through streams and water quality to coastal erosion. Technically the teams will survey information which will supply the GIS and geoportal development. The analytical capabilities of the multidisciplinary approach will provide a comprehensive analysis of future climate change scenarios and its projection in the assessment of natural and environmental risks. As a result in the for of output the team will propose regional adaptation measures, adequately discussed and disseminated

with local communities and local authorities.

Building upon the published research and the technical ability of the created consortium, CLIMRisk proposes the integrated study of climate, coastal areas, rivers, forestry, and biological variables, associated risks, thus building upon the created knowledgebase to propose useable tailor made adaptation measures.

Results: Participation in the 4th Internacional Conference on Ecohydrology, Soil and Climate Change, Figueira da Foz.

Outputs:

Communications

1. Andrade, C.; Veiga, A.; Santos, L.; Quinta-Nova, L.; Bom, M. J.; Pedro, N.; Fernandez, P.; Anastácio, R.; Mourato, S.; Touret, N.; Mendes, P., 2017. CLIMRisk -Climate change adaptation measures in the management of natural and environmental risks. In: Andrade, C. (ed.), 4rd International Conference on Ecohydrology, Soil and Climate Change - EcoHCC'2017. Polytechnic Institute of Tomar - Natural Hazards Research Center, Figueira da Foz, Portugal, p. 121.

Geotechnics and Engineering Geology

Anabela Quintela Nunes Veiga[1]

(1) Polytechnic Institute of Leiria, Morro do Lena, Leiria, Portugal; Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; anabela.veiga@ipleiria.pt

Project type: Research

Leader: Anabela Veiga

Coordination: Anabela Veiga

Team: Anabela Veiga and Sandra Mourato

Institutions involved: Polytechnic Institute of Leiria, Geosciences Centre of the University of Coimbra, ICAAM - Institute of Mediterranean Agricultural and Environmental Sciences, University of Évora

Goals: The main objective of this project is to perform the geotechnical characterization of several terrains in Leiria region (Parceiros - Leiria diapir), to assess the significance of its geotechnical characteristics in the safety conditions to urban use, and to assess the need for preventive or corrective measures.

It intends to analyse the effects of some natural events on particular type of terrain, such as the earthquakes on the alluvial soils, identifying potential hazards.

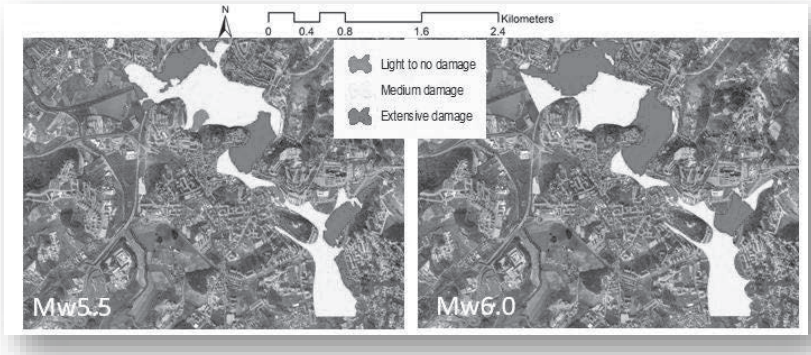
The results of this study associated with the survey of the exposed elements will allow to define the risk level of the buildings and infrastructures set up in these alluviums. The information generated is of great relevance to stakeholders in order to mitigate the risks associated with liquefaction and post-earthquake settlements.

Results:

Participation in the IV International Congress on Risks - "Risks and Education", Coimbra, Portugal

2017 - Participation in the 3rd WMESS – World Multidisciplinary Earth Sciences Symposium. Prague.

2017 - Participation in the organization of the workshop “Quando há um sismo porque é que alguns edifícios caiem e outros não?”, Francisco Rodrigues Lobo High School, Leiria.



Maps of the damage extend as a function of settlement values in Leiria. The probability of occurring an earthquake of Mw5.5 in the Leiria region is higher than that of an earthquake of Mw6. Comparatively the resulting settlements are not very different. Ishihara and Yoshimine (1992) established the relation between damage extend and approximate settlements (Table), defining three classes. Based on these classes, the maps of the Figure were obtained. These maps show that more than 97% of the area once subjected to an Mw5.5 earthquake can suffer medium to extensive damage and 30% of the area extensive damage. In the case of an Mw6.0 earthquake 42% of the area can suffer extensive damage. (from Veiga and Mourato, 2017).

Extent of damage	Settlements (cm)	Phenomena on the ground surface
Light to no damage	0~10	Minor cracks
Medium damage	10~30	Small cracks, oozing of sand
Extensive damage	30~70	Large cracks, spouting of sands, large offsets, lateral movement

Relation between damage extent and approximate settlements

Outputs:

Communications

1. Veiga, A.; Mourato, S., 2017. Análise geoestatística de assentamentos resultantes de potencial liquefação das aluviões do rio Lis. In: Riscos - Associação Portuguesa de Riscos, Prevenção e Segurança (Ed.), IV Congresso Internacional de Riscos - "Riscos e Educação" / IV International Congress on Risks - "Risks and Education", Coimbra, Portugal, p. 347.

2. Veiga, A.; Mourato, S., 2017. Geostatistical Analysis of Settlements Induced by Liquefaction due to Two Magnitude Earthquakes: Case Study River Lis Alluviums (Portugal). WMESS – World Multidisciplinary Earth Sciences Symposium. Prague.

Project Nº 23720: Geology as the basis for quality of life - the sustainability of lithium in the village of Gonçalo (Guarda-Portugal)

Ana Maria Antão[1]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; anantao@ipg.pt

Project type: Scientific research and technological development project (IC&DT) 02/SAICT/2016

Leader: Ana Maria Antão (IPG)

Coordination: Ana Maria Antão **(**Instituto Politécnico da Guarda- IPG)

Team: António Monteiro, Carlos Rodrigues Elizabete Soares, Elizabete Monteiro, Glória Patrício, Pedro Rodrigues, Adriano Costa, Ana Paula Gerardo, Ana Maria Ferreira, Mónica Sousa and Alexandra Carolino

Instituitions involved: Instituto Politécnico da Guarda - School of Technology and Management (IPG-ESTG), Instituto Politécnico da Guarda School of Hospitality and Tourism (IPG-ESTH), Instituto Politécnico de Tomar, Instituto Politécnico de Castelo Branco, Associação Portuguesa de Geólogos, Pegmatítica-Sociedade Mineira de Pegmatites Lda

Goals: IBEROEKA Miniforum-CYTED (LNEG, 2011) show the potential of Portugal as a European lithium producer; Strengthening research, technological development and innovation in depressed areas of Portugal; Sustainable management of natural endogenous geological resources; 3D modeling of mining area; Assessment of air, soil and water quality; Creation of a network of tracks and routes for tourism mining heritage.

Results:

Participation in CLME17 - International Congress (Mozambique) - paper presentation; https://paginas.fe.up.pt/clme/20177index.htm

Poster presentation in "*Semana de Ciência e Tecnologia*" - ISEP (Porto)- November 2016;

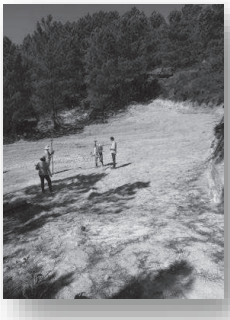
Project disclosure in the local news and radio:
https://soundcloud.com/altitudefm/ipg-fm-01-mar-2017
http://www.ointerior.pt/noticia.asp?idEdicao=926&id=55870&idSeccao=13460&Action=noticia

Field trip with students and Professors of Oporto University at the mine – Abril 2017;

Conference Competitiveness in Lithium Industry (EIT RawMaterials Central

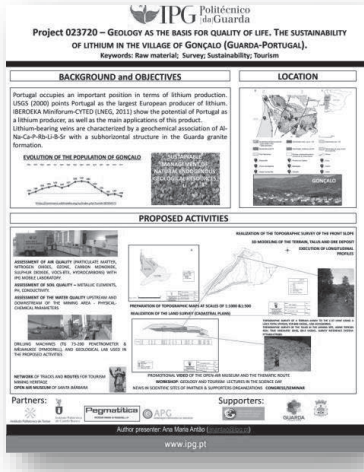
CLC organization) – October 2017 (Würzburg, Germany); https://www.lyyti.fi/p/Lithium

Meeting at IPG with Évora University master students and Professors – project evolution and dissemination - October 2017; http://www.ipg.pt/ipg-fm/emissoes.aspx (emission 211)



Strengthening research, technological development and innovation in depressed areas of Portugal.

Politécnico da Guarda desenvolve projeto de investigação sobre a sustentabilidade do Lítio



IPG Politécnico da Guarda

Project 023720 – GEOLOGY AS THE BASIS FOR QUALITY OF LIFE. THE SUSTAINABILITY OF LITHIUM IN THE VILLAGE OF GONÇALO (GUARDA-PORTUGAL).

Keywords: Raw material; Survey; Sustainability; Tourism

BACKGROUND and OBJECTIVES

LOCATION

PROPOSED ACTIVITIES

Partners:

Supporters:

Author presenter: Ana Maria Antão (mantao@ipg.pt)

www.ipg.pt

JORNAL DO FUNDÃO

IPG investiga o lítio explorado na vila de Gonçalo

DN

Lusa

Instituto Politécnico da Guarda desenvolve projeto de investigação sobre o lítio

Nacional

O Instituto Politécnico da Guarda (IPG) anuncios hoje que vai desenvolver, até novembro de 2018, um projeto de investigação sobre o lítio explorado na área da freguesia de Gonçalo, no concelho da Guarda.

O projeto, denominado "A geologia como base da qualidade de vida - A sustentabilidade do Lítio", é financiado pelo Sistema de Apoio à Investigação Científica e Tecnológica (SAICT).

31/07/2017

Nacional - Instituto Politécnico da Guarda desenvolve projeto de investigação sobre o lítio

PARTILHAS

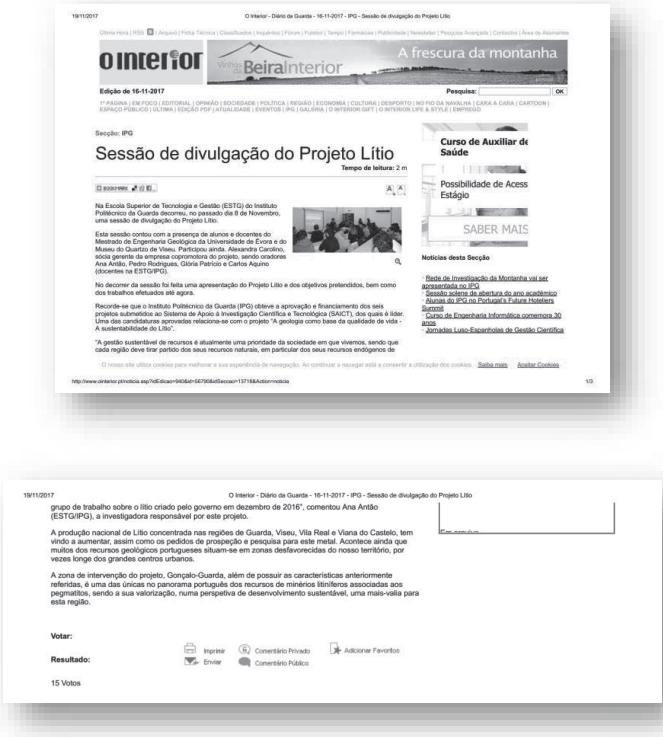
ENVIAR POR EMAIL

IMPRIMIR

"O investimento concedido é de cerca de 150.000 euros, sendo um projeto pioneiro por se pretender juntar a mais-valia da existência de recursos geológicos únicos (Portugal é o único país europeu com produção de concentrados de lítio e o sétimo a nível mundial), com a potencialidade de atividades de geoturismo numa região estigmatizada pelas repercussões que, no passado, as atividades do setor extrativo produziram", disse hoje à agência Lusa a professora do IPG Ana Antão, responsável pelo projeto.

Segundo Ana Antão, um dos objetivos do estudo é também permitir que as populações locais "possam conhecer os atributos dos seus recursos hídricos e do ar que respiram, pretendendo-se assim trazer a comunidade local para o seu território, maximizando um produto único e de atual relevância nas chamadas soluções tecnológicas limpas".

The sustainability of lithiumin the media.



The sustainability of lithiumin the media.

Outputs:

Articles:

1. Vieira, R.; Antão, A. M.; Carolino, A., 2017. "A importância estratégica dos depósitos litiníferos de Gonçalo (Guarda, Portugal) no atual panorama europeu de prospeção, avaliação e extração de lítio para aplicação em tecnologias verdes". Atas do 8º Congresso Luso-Moçambicano de Engenharia, Simpósio 6, pp.221-222, Maputo, setembro de 2017, Silva Gomes & al., Ed, ISBN: 978-989-98832-8-4

Paper preparation for the *Modern Environmental Science and Engineering journal*

Rockfall

Ana Maria Antão[1]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; anantao@ipg.pt

Project type: Analysis of rockfall in urban talus in Guarda area

https://paginas.fe.up.pt/clme/20177index.h

Leader: Ana Maria Antão (IPG)

Coordination: Ana Maria Antão **(**Instituto Politécnico da Guarda- IPG)

Team: Ana Maria Antão

Instituitions involved: Instituto Politécnico da Guarda - School of Technology and Management (IPG-ESTG)

Goals: It is intended with this study to perform a stability analysis of an excavation slope from an urban area of Guarda city, which presents large unstable zones especially after intense rainfall; use the software Rocfall 4.0 ®, for slope stability analysis in the area for defining the trajectories of rock falls related to the characteristics of the slope and the parameters of the materials involved.

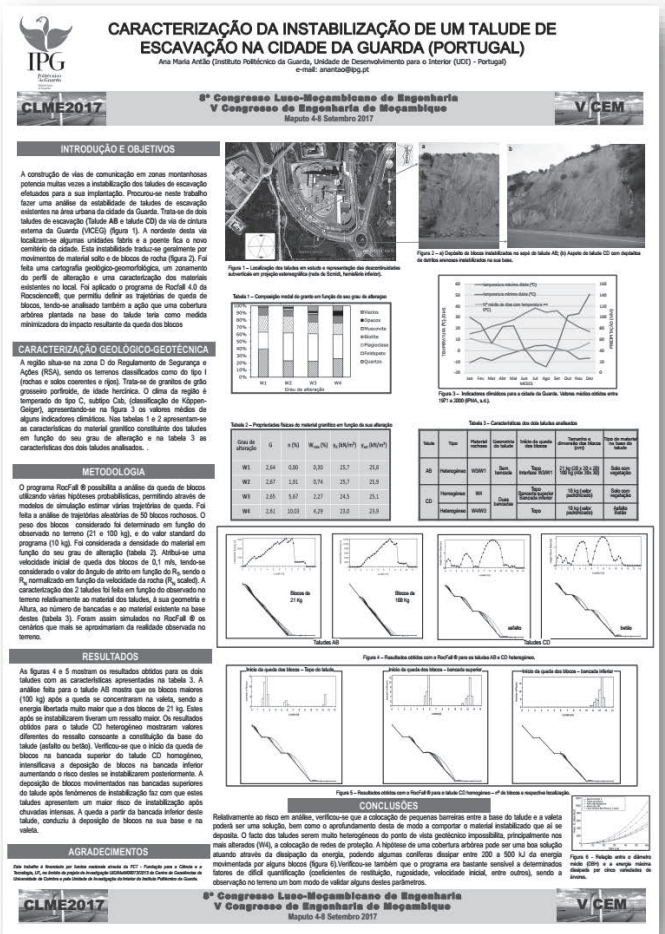
Results: Participation in CLME17-International Congress (Mozambique) – poster presentation:

Stability analysis of an excavation slope from an urban area of Guarda city.

Outputs:

Communications

1. Antão, A. M., 2017. Caracterização da instabilização de um talude de escavação na cidade da Guarda (Portugal). Poster presented in Congresso Luso-Moçambicano de Engenharia, Maputo, 4 – 8 September de Antão, A. M. (2017) - Caracterização da instabilização de um talude de escavação na cidade da Guarda (Portugal). Poster, Actas do 8º Congresso Luso-Moçambicano de Engenharia, Simpósio 6, pp.223-224, Maputo, setembro de 2017, Silva Gomes et al. (eds.), ISBN: 978-989-98832-8-4.



Poster presented at the Congresso Luso-Moçambicano de Engenharia (Maputo, Mozambique).

Radon

Ana Maria Antão[1]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; anantao@ipg.pt

Project type: The Radon gas in granitic zones

Leader: Ana Maria Antão (IPG)

Coordination: Ana Maria Antão (Instituto Politécnico da Guarda- IPG)

Team: Ana Maria Antão

Instituitions involved: Instituto Politécnico da Guarda - School of Technology and Management (IPG-ESTG)

Goals: It is intended with this study to make a awareness of the effects of radon gas and mitigation methods; Study the influence of construction type and the parameters of the materials involved.

Results:

Session on gas rádon (awareness and clarification) – Guarda parish January 2017;

Meeting at district delegation of *Ordem dos Engenheiros* about the Radon thematic – march 2017

Outputs:

Articles:

1. Carvalho, F., 2017. Problemática do Radão na região da Guarda. *Terras da Beira*. 30 of March, 2017.

RADÃO

86
Rn
Radon
(222,0176)

SESSÃO DE SENSIBILIZAÇÃO E ESCLARECIMENTO SOBRE OS MALEFÍCIOS, FORMAS DE CONTROLO E MITIGAÇÃO

Vimos por este meio convidar V. Ex.ª para estar presente nesta sessão de sensibilização e esclarecimento sobre o gás radão. Como oradores convidados contamos com a presença da Dra. Filomena Botelho do Instituto de Biofísica/Biomatemática da Faculdade de Medicina de Coimbra, o Engenheiro Bruno Nogueira da empresa Lusoradon e Dra. Ana Antão do Instituto Politécnico da Guarda.

ESPERAMOS POR SI NO DIA 21 JANEIRO DE 2017 PELAS 21:00 NO CENTRO CULTURAL SOCIAL E RECREATIVO DO BAIRRO DA LUZ

LIGA PORTUGUESA CONTRA O CANCRO · LUSORADON

Terras da Beira • 30 Março • 2017 — OPINIÃO

O Papa e a União Europeia

Memórias — Adriano Vasco Rodrigues

Uma cidadania medíocre? Não

O Mundo no coração da Igreja — P.e Tó Carlos

OBRAS (pré eleitorais)

Coisa e Tal — Agostinho Silva

Opinião

Problemática do Radão na região da Guarda.

Promovido pela Delegação Distrital da Guarda da Ordem dos Engenheiros, realizou-se no passado dia 22 de Março, um jantar/convívio com a apresentação do tema "A problemática do radão em edificações da região da Guarda", pela Profª. Doutora Ana Maria M. C. Antão, do Instituto Politécnico da Guarda. Face à pertinência do tema, compareceu um número apreciável de engenheiros ao jantar, que decorreu num restaurante situado junto às Portas do Sol. A ementa de cariz regional, provas de chouriça, foi do agrado de todos.

Subordinado ao tema em epígrafe, foi apresentado um resumo das características deste gás e das implicações que tem a nível de saúde, sendo de realçar a posição da Organização Mundial de Saúde, que considera a inalação/ingestão contínua deste gás como a principal fonte de cancro do pulmão em não fumadores.

Após um resumo da informação existente sobre medições deste gás em habitações e escolas da região centro, passou-se à análise da problemática na zona da Guarda.

Devido às características geológicas do maciço rochoso, onde são implantadas as fundações do edificado, à utilização do granito da Guarda como alvenaria em muitas obras, ao clima da região com invernos rigoroso e extensos e aos hábitos dos seus habitantes, os dados obtidos de medições aí efetuadas perspetivam uma inconformidade da QAI, que é necessário acautelar. Com efeito, a legislação nacional (decreto-lei nº 79/2006 e portaria nº 353-A/2013 de 4 de Dezembro) aponta para a obrigatoriedade da análise de radão "...em edifícios construídos em zonas graníticas, nomeadamente nos distritos de Braga, Vila Real, Porto, Guarda, Viseu e Castelo Branco", definindo nomeadamente um limiar máximo de proteção desse poluente de 400 Bq/m3 para o ar interior das edificações. Também a recente legislação nacional (decreto-lei nº 23/2016 de 3 de Junho), transpôs para o direito nacional a diretiva nº 2013/51/EURATOM do Conselho de 22 de outubro de 2013, sobre a obrigatoriedade de medição de radão em águas de consumo humano, tendo como valor paramétrico da sua qualidade 500 Bq/l.

Com efeito, sabendo os decisores políticos e os técnicos destas características e especificidades, torna-se fácil promover medidas que minimizem o risco inerente nestas regiões, quer em edificações já construídas, quer a edificar.

Fonseca de Carvalho

Radon in the region of Guarda.

Applied Geophysics: gravity and magnetic methods

Ana Machadinho[1]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; ana.machadinho@gmail.com

Project type: PhD funding by Fundação para a Ciência e Tecnologia (FCT) - The presented work is related to my PhD concluded in 2015 (**PhD thesis:** Modelação da geometria de rochas granitóides recorrendo a métodos geofísicos gravimétricos e magnéticos: uma contribuição para a avaliação do potencial geotérmico na região Centro de Portugal)

Leader: Ana Machadinho

Coordination: Fernando Pedro Figueiredo and Alcides Castilho Pereira

Team: Ana Machadinho, Fernando Pedro Figueiredo and Alcides Castilho Pereira

Institutions involved: Faculty of Sciences and Technology and Geosciences Center of the University of Coimbra

Goals: The aim of this study is the analysis of geological and potential field data (gravity and magnetic data) to better understand the subsurface geometry of the granitic bodies in Central Portugal. The modeling results show depth estimates for the subsurface structure of the crust and are also relevant for the assessment of the geothermal potential of this region.

Results: Participation in the 10º Simpósio de Meteorologia e Geofísica da APMG e 18º Encontro Luso-Espanhol de Meteorologia – Riscos associados a fenómenos meteorológicos e geofísicos, 20-22 de março de 2017, Lisboa (Portugal).

Outputs:

Communications

1. Machadinho, A.; Figueiredo, F.; Pereira, A., 2017. Gravity and magnetic modelling of granites in Central Portugal. Proceedings of the 10º Simpósio de Meteorologia e Geofísica da APMG e 18º Encontro Luso-Espanhol de Meteorologia, 6 p. (*in press*).

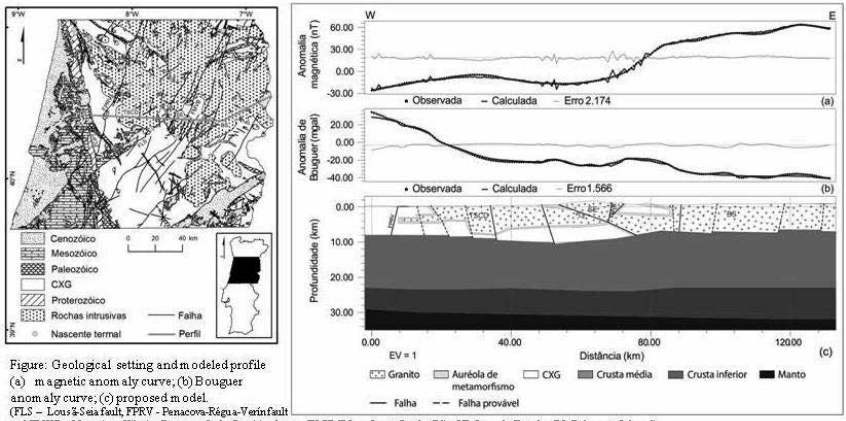


Figure: Geological setting and modeled profile (a) magnetic anomaly curve; (b) Bouguer anomaly curve; (c) proposed model. (FLS – Lous㠓Seia fault, FFRV - Penacova-Régua-Verín fault and FMVB – Manteigas-Vilariça-Bragança fault; Granitic plutons: TSCD Tábua-Santa-Comba-Dão, SE-Serra da Estrela e BS-Belmonte-Sabugal).

Geological setting and modeled profile (from Machadinho et al., 2017).

Vulnerability assessment in Fervença watershed (Cantanhede, Portugal)

Carla G. Correia[1,2], Fernando Figueiredo[1,2,3], José M. Azevedo[1,4] and Nelson V. Rodrigues[1,2,3]

(1) Department of Earth Sciences of the University of Coimbra, Rua Sílvio Lima, UC – Pólo II, 3030-790 Coimbra, Portugal; c.correia@hotmail.com, fpedro@dct.uc.pt, jazevedo@dct.uc.pt, nelsonr@ci.uc.pt

(2) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, UC – Pólo II, 3030-790 Coimbra, Portugal

(3) Centre for Mechanical Engineering of the University of Coimbra (CEMUC), Pinhal de Marrocos, 3030-788 Coimbra, Portugal

(4) Center for Earth and Space Research of the University of Coimbra (CITEUC), Observatório Astronómico, Sta Clara, 3040-004 Coimbra, Portugal

Project type: Research /PhD project

Leaders: Carla G. Correia

Coordination: Carla G. Correia

Team: Carla G. Correia, Fernando Figueiredo, José M. Azevedo and Nelson V. Rodrigues

Instituitions involved: Department of Earth Sciences of the University of Coimbra; Geosciences Centre of the University of Coimbra; FCT - Fundação para a Ciência e a Tecnologia, I.P. and Financing Program POPH/FSE; and FCT - Fundação para a Ciência e a Tecnologia, I.P., through Portuguese funds, in the research project UID/Multi/00073/2013 of the Geosciences Centre of the University of Coimbra

Goals: Fervença watershed, groundwater, evaluation of intrinsic vulnerability, DRASTIC method and COP method.

Results:

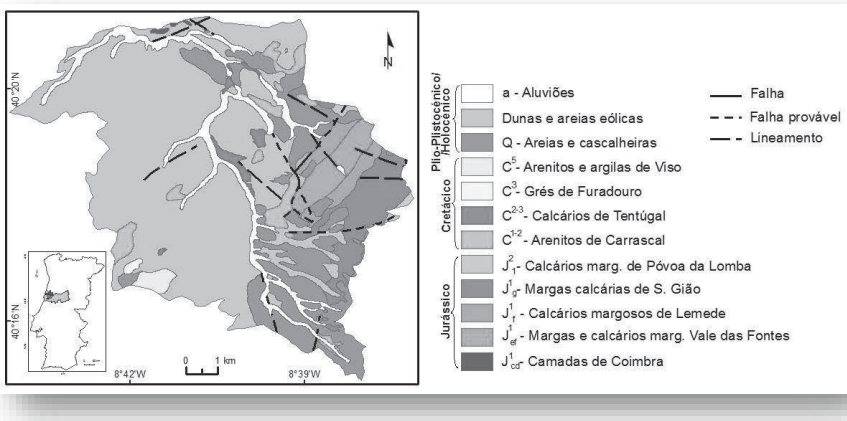
Participation in the 11.º Seminário sobre Águas Subterrâneas, Associação Portuguesa de Recursos Hídricos, Instituto Superior de Engenharia do Porto e Grupo Português da Associação Internacional de Hidrogeólogos, Porto.

Carla G. Correia reviews articles submitted for publication in the international journal "Sustainable Water Resources Management", Springer International Publishing AG (ISSN: 2363-5037 (Print) 2363-5045 (Online)); online: https://link.springer.com/journal/40899

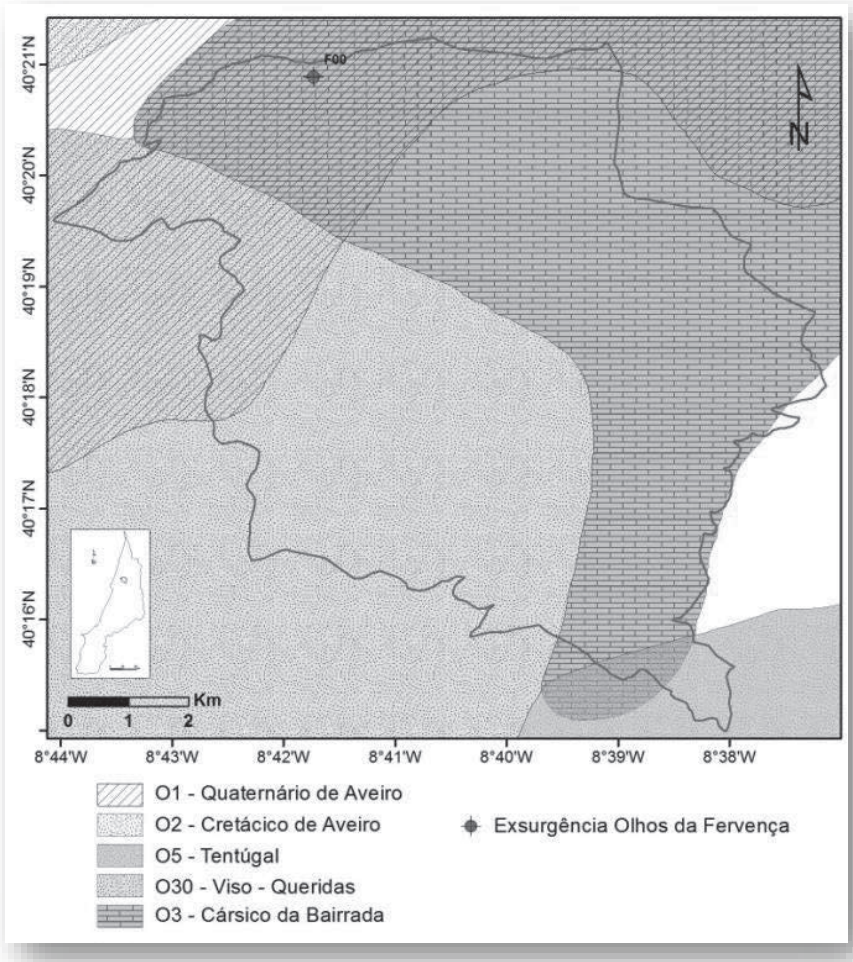
Outputs:

Communications

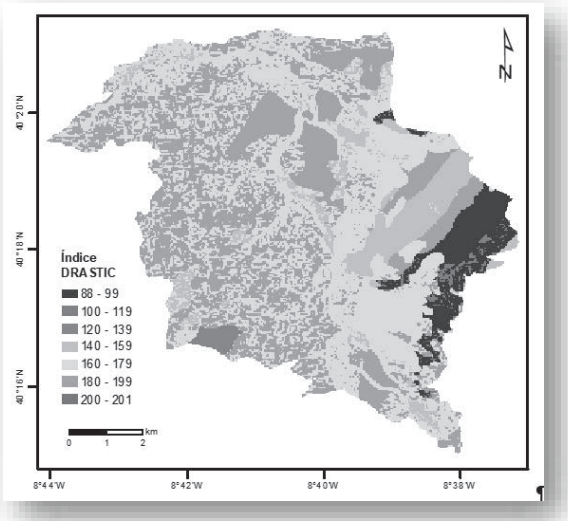
1. Correia, C. G.; Figueiredo, F.; Azevedo, J. M.; Rodrigues, N. V., 2017. Avaliação da Vulnerabilidade na Bacia Hidrográfica de Fervença (Cantanhede, Portugal), 11º Seminário sobre Águas Subterrâneas. APRH, ISEP e AIH - GP. Porto, Abstract Book, p. 56-59.



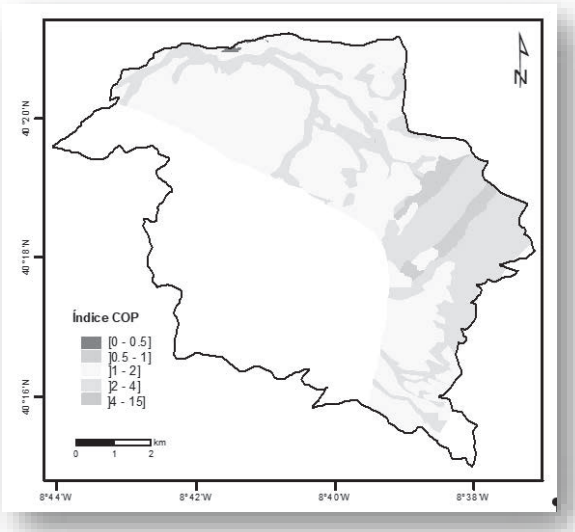
Location of the Fervença watershed and simplified representation of geology (adapted from Barbosa et al., 1987-88, in Correia et al., 2017).



Framework of the Fervença watershed in the regional aquifer systems (adapted from SNIRH, 2014 in Correia et al., 2017).



Intrinsic vulnerability map of the Fervença watershed according to the DRASTIC index (from Correia et al., 2017).



Intrinsic vulnerability map of the carsic aquifer, in the Fervença watershed, according to the COP index (from Correia et al., 2017).

Characterization of rocks and mineral resources

Daniela Maria Fernandes Pedrosa[1], Mário Quinta Ferreira[1] and Lídia Catarino[1]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; daniela.pedrosa@uc.pt, mqf@dct.uc.pt, lidiagil@dct.uc.pt

Project type: Research fellowship

Leaders: Mário Quinta Ferreira

Coordination: Mário Quinta Ferreira and Lídia Catarino

Team: Daniela Pedrosa, Mário Quinta Ferreira, Lídia Catarino and Fernando Figueiredo

Instituitions involved: Geosciences Center of the University of Coimbra

Goals: The domain of the work is related to the characterization of rocks and mineral resources in the scope of engineering geology. Research is also developed on the themes of preservation of the built heritage and identification of the geological and geomorphological characteristics associated with alluvial gold deposits in the river Alva (Coimbra).

Support to the research developed by the geotechnology group of CGeo, both in the laboratory and in the field is developed.

Results: Participation in XXII Bienal da Real Sociedad Española de História Natural, Coimbra (Portugal).

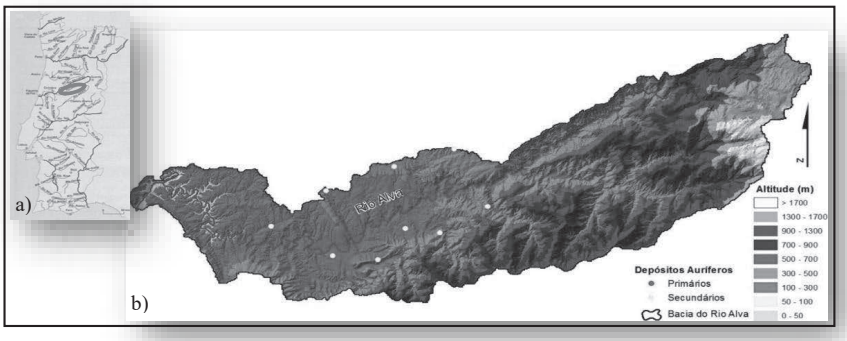
Outputs:

Communications

1. Pedrosa, D., Figueiredo, F. P., Catarino, L., Piedade, A., 2017. Exploração de Depósitos de Ouro Aluvionar no Rio Alva (Bacia Hidrográfica do Mondego). In Baratas Díaz, A., Barroso-Barcenilla, F., Tonicher, P. C. (Eds.), Livro de Resumos da XXII Bienal da Real Sociedad Española de História Natural. Coimbra (Portugal).

2. Pedrosa, D., Figueiredo, F. P., Catarino, L., Piedade, A., 2017. Exploração de Depósitos de Ouro Aluvionar no Rio Alva (Bacia Hidrográfica do Mondego). XXII Bienal da Real Sociedad Española de História Natural, Coimbra (Portugal). Poster

Traces of gold exploration in the basin of the river Alva.



***(a)** Location of the Alva river basin; **(b)** Digital model of the Alva river basin, with identification of the primary and secondary gold deposits that were registered and identified as mining concessions and gold exploration in antiquity.*

Aerial survey of rock masses with UAV

João António Marques Duarte[1]

(1) IQGeo,Lda and Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; joao.aduarte@iqgeo.pt

Project type: PhD thesis

Leader: João António Marques Duarte

Coordination: Mário Quinta Ferreira, Fernando Pedro Figueiredo and Alcides José Pereira

Team: João António Marques Duarte, Mário Quinta Ferreira, Fernando Pedro Figueiredo and Alcides José Pereira

Instituitions involved: Geosciences Center of the University of Coimbra, IQGeo – Serviços Lda and Geosciences Department of University of Aveiro

Goals: The objective was to evaluate geological and structurally the rock masses, through the characterisation of their location, types of orientation and frequency of discontinuitys, the quality and quantity of the types lithological present, as well as modeling their provisions and spatial interrelations.

Results:

- Geophysical prospecting campaigns using the Transient Electromagnetic Method [TEM];

- Geological-structural survey campaigns with the objective of mapping fracturing and associated structures, geology and its stratigraphic aspects;

- Aerial survey campaigns, using the use of unmanned aerial vehicle [UAV], use of photogrammetry for geological-structural evaluation.

Outputs:

- Submission of an article "Accuracy and effectiveness of low cost UASs and open source Photogrammetric software for foredunes mapping" (TRES-PAP-2017-1099), as co-author, in the International Journal of Remote Sensing.14th November, 2017.

- Co-author of the oral presentation on VIII Cong. Nac. Geomorfologia. 4-7 Outubro 2017 / faculdade de Letras da Universidade do Porto/ Portugal. Registos geomorfológicos e sedimentares do Plio-Plistocénico de Peniche - Atouguia da Baleia.

- PhD thesis delivery on 31st August, 2017.

- Poster presentation on Small Unmanned Aerial Systems for Environmental Research – 5th Edition. 28th-30th June 2017/UTAD/Vila Real/Portugal. A UAV and SFM approach as a fast and complete methodology on morphostructural analysis.

- Co-author of the abstract on Small Unmanned Aerial Systems for Environmental Research – 5th Edition. 28th-30th June 2017/UTAD/Vila Real/Portugal: "Combining UAV photogrammetry and open source software for fast and effective assessment of coastal erosion – the case study of South Cova da Gala's beach, Portugal". DOI: 10.13140/RG.2.2.18231.42401

- Oral presentation on 11º Seminário sobre Águas Subterrâneas, held on 2nd March 2017, in Porto: "Contributo do Método Electromagnético de Transiente (TEM) na prospecção hidrogeológica: caso de estudo na Ilha da Brava, Cabo Verde".

- Conference Paper, March 2017, "Caracterização e modelação geofísica na cratera do vulcão do Fogo, Cabo Verde". 10º Simpósio de Meteorologia e Geofísica da APMG. Lisbon.

- Oral presentation on 10º Simpósio de Metereologia e Geofísica da APMG, held on 21st March 2017, in Lisbon: "Caracterização e modelação geofísica na cratera do vulcão do Fogo, Cabo Verde".

Monumental stone biodeterioration assessment within the UNESCO World Heritage site 'University of Coimbra - Alta and Sofia'

Lídia Catarino[1]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; lidiagil@dct.uc.pt

Project type: R&D Project PTDC/EPH-PAT/3345/2014

Leader: António Manuel Santos Carriço Portugal

Coordination: António Manuel Santos Carriço Portugal

Team: António M. S. C. Portugal, António Xavier de Barros e Cunha Pereira Coutinho, Francisco P.S.C. Gil, Guadalupe Larrubia, Hugo Luís da Silva Paiva de Carvalho, Joana Costa, J. Trovão, Lídia Catarino, M. Teresa Gonçalves, Nuno Mesquita and Pedro Ferrão

Instituitions involved: University of Coimbra, Museu Nacional de Machado de Castro, (MNMC/IPM), University of Natural Resources and Life Sciences (BOKU),Centro de Ecologia Funcional (CFE/FCT/UC), Centro de Física da Universidade de Coimbra (CFisUC), Centro de Geociências (CG/FCT/UC)

Goals: A) Produce a detailed inventory of the biodeterioration phenomena presented by several monumental limestones (indoor/outdoor environments) within the UNESCO site in Coimbra, identifying the responsible biodeteriorating species by using molecular

(PCR/DGGE/Sequencing) and morphological approaches;

B) Characterize the endo and epi-colonization of the main limestone types, linking them with the observed deterioration processes and pigments; and evaluate the importance of limestone physicochemical (mineral, organic and inorganic composition) andstructural characteristics (porosity, density, permeability, etc.) on their bioreceptivity and degradation potential;

C) Develop control procedures that target specific biodeteriorating microorganisms, from damaged areas, promoting the development of monitoring/control procedures in Heritage sites with better cost/benefit relation;

D) Evaluate indoor/outdoor air bioburden, and establish monitoring procedures for regular assessment in Heritage sites concerning airborne and surface contamination, and well as the biodeteriorating potential of new species, considering the threat to the health of visitors and the risk to heritage objects; Assess the effects of recent

restoration efforts on microbial community changes and re-colonization.

Outputs:

Communications

1. Trovão, J.; Soares, F.; Mesquita, N.; Coelho, C.; Tiago, I.; Gil, F.; Catarino, L.; Piñar, G.; Pinheiro, A. C.; Portugal, A., 2017. A multi-analytical approach to study Limestone Biodeterioration and Biological colonization in the Old Cathedral (Sé Velha) of the UNESCO World Heritage site 'University of Coimbra - Alta and Sofia'. 3th Technoheritage 2017 International Congress, Cádiz, Spain, 20-24 May 2017.

2. Trovão, J.; Soares, F.; Mesquita, N.; Coelho, C.; Tiago, I.; Gil, F.; Catarino, L.; Piñar, G.; Pinheiro, A. C.; Portugal, A., 2017. A multi-analytical approach to study Limestone Biodeterioration and Biological colonization in the UNESCO World Heritage site 'University of Coimbra - Alta and Sofia'. Encontro Ciência 2017, FIL, Lisboa, 3-5 July 2017.

3. Pinheiro, A. C.; Soares, F.; Trovão, J.; Coelho, C.; Tiago, I.; Paiva De Carvalho, H.; Gil, F.; Catarino, L.; Piñar, G.; Mesquita, N.; Portugal, A., 2017. Mycostone: A comprehensive approach on the study of limestone biodeterioration. 2nd International Conference on Structural Integrity - International Symposium on Degradation and Conservation of Ancient Materials and Structures (Thematic Symposium). Funchal, Madeira, Portugal, 4-7 September, 2017.

4. Mesquita, N.; Trovão, J.; Paiva De Carvalho, H.; Coutinho, A. P.; Costa, J.; Catarino, L.; Gil, F.; Piñar, G.; Gonçalves, M. T.; Ferrão, P.; Portugal, A., 2017. Monumental stone biodeterioration assessment within the UNESCO World Heritage site 'University of Coimbra - Alta and Sofia': Project introduction. International Conference of Biodeterioration & Protection of Cultural Heritage. Lodz, Poland, 8-9 September 2016.

5. Pinheiro, A. C.; Mesquita, N.; Coelho, C.; Soares, F.; Paiva De Carvalho, H.; Gil, F.; Catarino, L.; Piñar, G.; Trovão, J.; Tiago, I.; Portugal, A., 2017. Coupling air and surface samples: input on the study of biodeteriorated limestone and public health analyses. 3th Technoheritage 2017 International Congress, Cádiz, Spain, 20-24 May 2017. Painel.

6. Mesquita, N.; Pinheiro, A. C.; Trovão, J.; Soares, F.; Coelho, C.; Paiva De Carvalho, H.; Gil, F.; Tiago, I.; Portugal, A.; Catarino, L., 2017. Biodeterioration of Limestone by Oxalic Acid producers in the UNESCO site 'University of Coimbra - Alta and Sofia'. International Conference "Natural stone for cultural heritage: local resources with global impact". Prague, Czech Republic, 19-22 September 2017. Painel.

Archaeological site of São Simão 2016-2019: valorization of findings and the surrounding territory

Lídia Catarino[1]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; lidiagil@dct.uc.pt

Project type: Archaeological Research Project

Leaders: Sónia Maria Gomes Vicente

Coordination: Sónia Maria Gomes Vicente

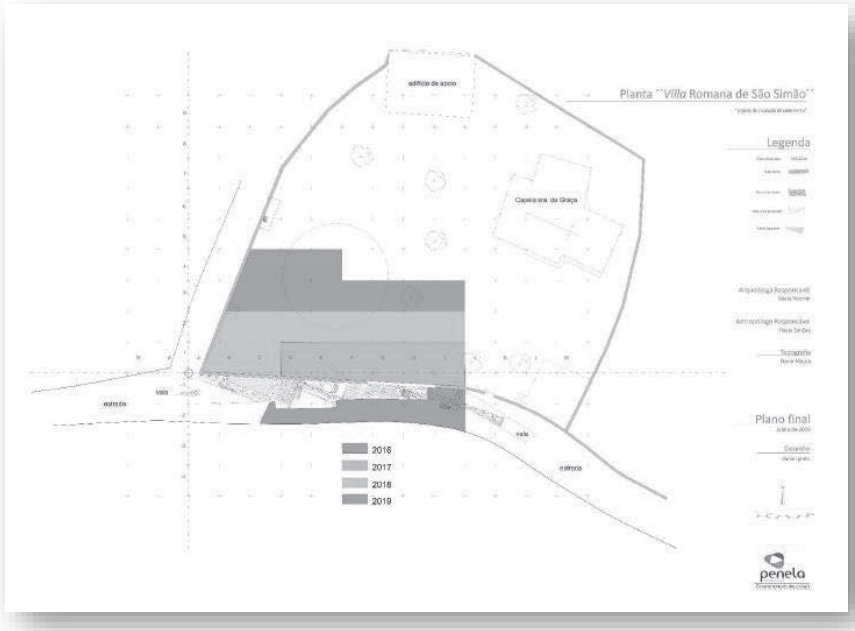
Team: Sónia M. G. Vicente, Flávio M. B. Simões, Ana Luísa Ravara Mendes and Mário J. S. Duarte. Scientific Consultants: Ana Maria Silva, Filomena Limão, José Carlos Quaresma Lídia Catarino Miguel Pessoa Pedro Jorge Carvalho and Pedro Sales

Instituitions involved: Municipality of Penela, Museu Monográfico de Conímbriga (MMC/IPM), Nova University of Lisbon (FCSH) University of Coimbra (FLUC, CIAS, CGEO)

Goals: Characterize the space of the Villa de São Simão - exposing and exploring, all available archeological resources through archaeological methodology. Characterize the Necropolis, trying to perceive its chronology and connection to the space of the villa and the chapel of Sr. da Graça. Also obtain the paleobiological and paleodemographic profile of exhumed individuals. Investigate the possible connection between the current space of the Chapel and the Villa with the Hermitage/Franciscan Convent. Preparation of a safeguard plan**.**

Results: The collaboration of the CGeo in this project includes the study of ceramics and mortars made with the collaboration of the Daniela Pedrosa grantee. So far the chemical composition of ceramic fragments collected in the excavation has been evaluated, which are being compared with similar pieces collected in the Roman Villa of Rabaçal. Soon the study of mortars will begin.

Outputs:



Partial plant of the chapel of Sr. da Graça with the planed areas to excavation.

Science Fostering

Anabela Quintela Nunes Veiga[1]

(1) Polytechnic Institute of Leiria, Morro do Lena, Leiria, Portugal
Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal;
anabela.veiga@ipleiria.pt

Project type: Research

Leader: Anabela Veiga

Team: Anabela Veiga, Cátia Sá and Vânia Carvalho

Institutions involved: Polytechnic Institute of Leiria, Geosciences Center of the University of Coimbra, Faculty of Sciences and Technology Center of the University of Coimbra, Leiria Museum – Leiria city council

Goals: Fostering scientific culture among the general population. It is intended to disseminate Geosciences, in particular the Geology of the region of Leiria, to the local community. Stimulating the observation of the surrounding environment and awaken to the interpretation of geological phenomena. Contributing to the increase of scientific culture and awareness for the preservation and protection of the geological environment.

Results:

Participation in the "XII Bienal de la Sociedad Española de Historia Natural", Coimbra (Portugal).

Participation in the organization of events:

2017 - Responsible for the organization of the activity "Passeios geológicos" held with Domingos Sequeira High School students, Leiria

2017 - Responsible for the activity "Passeio Geológico pelo morro do Castelo" on the International Day of Museums and sites - Leiria Museums

2017 - Responsible for the activity "As pedras do convento de Santo Agostinho" on the International Day of Museums and sites - Leiria Museums

The long-term exhibition of the Leiria Museum de integrates two nuclei dedicated to Palentology: the fossils of the Guimarota Mine and the Menino do Lapedo.

Museums are prime locations for the intermediation of science, researchers and the general public (Brandão et al, 2014). In the activity "As pedras do convento de Santo Agostinho" a simple collection of fossils is used for the dissemination of local geology and paleontology, to the community that first gave rise to it. Bringing citizens closer to Geosciences brings them closer to their city, their history, the history of man and the history of the Earth!

Outputs:

Communications

1. Sá, C.; Carvalho, V.; Veiga, A., 2017. O Museu de Leiria e a divulgação da Paleontologia local. Em F. B.-B. Alfredo Baratas Díaz (Ed.), Livro de Resumos da XXX Bienal da RSEHN. Madrid-Coimbra: Real Sociedad Española de Historia Natural.

Engineering Geology

Mário Quinta-Ferreira[1] and Santiago Alija Sanches[1]

(1) Geosciences Centre of the University of Coimbra, Department of Earth Sciences of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; mqf@dct.uc.pt; santiagoalija@gmail.com

Project type: Applied Research

Leader: Mário Quinta Ferreira

Coordination: Mário Quinta Ferreira and Santiago Alija Sanches

Team: Mário Quinta Ferreira, Santiago Alija Sanches, Francisco Javier Torrijo, Julio Garzon-Roca, António Veiga Pinto, Pedro Santarém Andrade, Isabel Fernandes, Susana Vilanova and Anabela Veiga

Instituitions involved: Geosciences Center of the University of Coimbra, Instituto Politécnico de Leiria, Universitat Politecnica de Valencia; Universidad Internacional de La Rioja, University of Lisboa

Goals: Study the engineering geology properties of the terrain for a suitable geotechnical characterization for foundations and engineering works, such as harbours, dams, buildings or slopes. Study of the pathologies of geotechnical structures. Optimization of rockfill design and construction.

Results:

Participation in the "17th International Multidisciplinary Scientific GeoConference SGEM 2017 (Varna, Bulgaria)".

Participation in the "XII Bienal de la Real Sociedad Española de Historia Natural", Coimbra (Portugal).

Participation in the World Multidisciplinary Earth Science Symposium - WMESS 2017, In WMESS 2017, Prague, Czech Republic.

Outputs:

Book chapters

1. Quinta-Ferreira, M., 2017. Engineering geological models and site investigation. In 17th International Multidisciplinary Scientific GeoConference SGEM2017, Science and Technologies in Geology, Exploration and Mining, ed. 17th International Multidisciplinary Scientific GeoConference SGEM 2017, 289 - 296. ISBN: 978-619-7105-99-5. Sofia: Stef92 Technology Ltd. DOI: 10.5593/sgem2017/12/S02.037

2. Alija, S.; Quinta-Ferreira, M.; Torrijo, F. J.; Arroyo, R., 2017. Investigating construction problems of a drystone retaining wall. In SGEM2017 Conference Proceedings, ed. 17th International Multidisciplinary Scientific GeoConference SGEM 2017, 477 - 484. ISBN: ISBN 978-619-7105. Sofia: STEF92 Technology Ltd. DOI: 10.5593/sgem2017/12/S02.061.

Articles

1. Torrijo, F. J; Garzón-Roca, Julio; Alija, Santiago; Quinta-Ferreira, M., 2017. "Dynamic compaction evaluation using in situ tests in Sagunto's Harbor, Valencia (Spain)", Environmental Earth Sciences 76, 19: 1 - 9. DOI: 10.1007/s12665-017-7033-7.

2. Andrade, P. S.; Quinta-Ferreira, M., 2017. The Geological-Geotechnical Cartography Applied to Geotechnics. Examples of Application in Portugal. Memorias de la Real Sociedad Española de Historia Natural, Segunda época, Tomo XIV, pp. 193-207.

Communications

1. Ferraz, A. R.; Fernandes, I.; Soares, D.; Silva, A. S.; Quinta-Ferreira, M., 2017. "Assessment of the alteration of granitic rocks and its influence on alkalis release", Trabalho apresentado em World Multidisciplinary Earth Science Symposium - WMESS 2017, In WMESS 2017 Symposium volume, Prague.

2. Oliveira, P. H; Quinta-Ferreira, M., 2017. "Notes on engineering geology studies for railway ore transport projects", Trabalho apresentado em World Multidisciplinary Earth Science Symposium - WMESS 2017, In WMESS 2017 Symposium volume, Prague.

3. Quinta-Ferreira, M., 2017. "Combining geology and site investigation for a small engineering project on soft soils", Trabalho apresentado em World Multidisciplinary Earth Science Symposium - WMESS 2017, In WMESS 2017 Symposium volume, Prague.

Anchored retaining beam and anchor pressure gauge.

Geotechnology

Mário Quinta-Ferreira[1]

(1) Geosciences Centre of the University of Coimbra, Department of Earth Sciences of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; mqf@dct.uc.pt; santiagoalija@gmail.com

Project type: Applied Research

Leader: Mário Quinta Ferreira

Coordination: Mário Quinta Ferreira

Team: Mário Quinta Ferreira, Lídia Catarino, Pedro Santarém Andrade, Santiago Alija Sanches, Antóno Luís de Almeida Saraiva, Anabela Veiga, Ana Antão, Ana Machadinho, Carla Correia, Daniela Pedrosa, Fernando Pita, João Duarte, Francisco Javier Torrijo, António Veiga Pinto, Isabel Fernandes and Susana Vilanova

Instituitions involved: Geosciences Center of the University of Coimbra, Instituto Politécnico de Leiria, Universitat Politecnica de Valencia; Universidad Internacional de La Rioja, University of Lisboa

Goals: The work of the Geotechnology Group is based on two main topics of study, Geological Materials and Geological Engineering. The research and consultancy work carried out is mainly aimed at solving problems of society that are related to the two themes mentioned above, in the present and in the past. However, the preservation of built heritage is also an important research topic, which has gained importance in research topics within the scope of the Group.

Results: The works developed, relate to transversal lines of the CGeo in a wide range of fields, including Engineering Utilization of Geological Materials, Slope Stability, Environment Geotechnology and Geophysical Prospecting, which has generated research and publications on various topics, such as:

- Study of geological materials used in historical buildings, civil engineering and industry;

- Weatherability of natural materials used in monuments and buildings, and study of old mortars;

- Slope stability and geomechanics of slopes;

- Geotechnical properties of soft rocks;

- Ordnance and surveying - geological and geotechnical surveying for better management;

- Engineering Geology applications to archeology, groundwater resources, building assessment and environmental assessment;

- Construction wastes processing, improvement and beneficiation, as an alternative to geological materials.

Outputs:

Alluvial plain as a resource for raw materials and mining.

Raw Material

Mário Quinta-Ferreira[1] and Pedro Santarém Andrade[1]

(1) Geosciences Centre of the University of Coimbra, Department of Earth Sciences of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; mqf@dct.uc.pt; pandrade@dct.uc.pt

Project type: Research and Innovation

Leaders: Mário Quinta Ferreira and Pedro Santarém Andrade

Coordination: Mário Quinta Ferreira and Pedro Santarém Andrade

Team: Mário Quinta Ferreira and Pedro Santarém Andrade, Fernando Pedro Figueiredo, Fernando Castelo Branco, Isabel Fernandes and Luís de Sousa

Instituitions involved: Geosciences Center of the University of Coimbra, University of Lisbon and UTAD

Goals: Investigate the properties of natural materials used in engineering works, construction and environmental. Evaluate the raw materials properties, availability and weatherability. Quality control and reliability of test.

Results:

Participation in the "17th International Multidisciplinary Scientific GeoConference SGEM 2017 (Varna, Bulgaria)".

Participation in the organization of scientific events:

2017 – "XII Bienal de la Real Sociedad Española de Historia Natural", Coimbra (Portugal). Comissão de Organização.

Submission and publication of articles, book chapters and books.

Co-supervision of Master of Science in Geological and Mining Engineering, conclued in 2017:
Tobar-Torres, J. (2017) - Excavatability Assessment of Limestone Rock Masses of Ançã and Souselas Areas. Departamento de Ciências da Terra, Faculdade de Ciências e Tecnologia da Universidade de Coimbra, 157 p.

Outputs:

Articles

1. Branco, F. C.; Quinta-Ferreira, M.; Fernandes, I., 2017. "Characteristics of aggregates used in road construction in Portugal, complying with the requirements of European Conformity (CE marking)", Bulletin of Engineering Geology and the Environment, pp. 1 - 13. DOI: 10.1007/s10064-017-1066-8

2. Sousa, L.; Barabasch, J.; Stein, K-J.; Siegesmund, S., 2017. Characterization and quality assessment of granitic building stone deposits: A case study of two different Portuguese granites. Engineering Geology 221, 29–40. http://dx.doi.org/10.1016/j.enggeo.2017.01.030.

3. Sousa, L. M. O., 2017. Current approaches in the research of dimension stones: from quarry to heritage. Adv Geo Sci, Vol. 2. p 1-4. DOI: http://dx.doi.org/10.21065/.

4. Yarahmadi, R.; Bagherpour, R.; Tabaei, M.; Sousa, L. M. O., 2017. Investigation of intact rock geomechanical parameters' effects on commercial blocks' productivity within stone reserves: A case history of some quarries in Isfahan, Iran. Journal of African Earth Sciences 134, 383-388.

5 Yarahmadi, R.; Bagherpour, R.; Taherian, S-G.; Sousa, L. M. O., 2017. A new quality factor for the building stone industry: a case study of stone blocks, slabs, and tiles. Bull Eng Geol Environ. DOI 10.1007/s10064-017-1040-5 (*in press*).

6. Yarahmadi, R.; Bagherpour, R.; Khademian, A.; Sousa, L. M. O.; Almasi, S. N.; Esfahani M. M., 2017. Determining the optimum cutting direction in granite quarries through experimental studies: a case study of a granite quarry. Bull Eng Geol Environ. DOI 10.1007/s10064-017-1158-5 (*in press*).

Communications

1. Tobar-Torres, J.; Andrade, P. S.; Figueiredo, F. P., 2017. Metodologia de estudo da escavabilidade de maciços rochosos calcários das áreas de Ançã e Souselas. XXII Bienal de la Real Sociedad Española de Historia Natural (RSEHN), Coimbra, Abstract Book, pp. 282-283.

Natural aggregates: rounded cobbles.

Slope Stability Assessment

Pedro Santarém Andrade[1] and Mário Quinta-Ferreira[2]

(1) Geosciences Centre of the University of Coimbra, Department of Earth Sciences of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; pandrade@dct.uc.pt; mqf@dct.uc.pt

Project type: Research and Innovation

Leaders: Pedro Santarém Andrade and Mário Quinta Ferreira

Coordination: Pedro Santarém Andrade and Mário Quinta Ferreira

Team: Pedro Santarém Andrade, Mário Quinta Oliveira and António Luís Almeida Saraiva

Instituitions involved: Geosciences Center of the University of Coimbra and Tundavala Polytechnic Institute

Goals: Slope stability assessment. Rockfall hazard and risk assessment. Evaluation and mapping of the rockfall risk areas. Geological-geotechnical cartography. Public understanding of engineering geology.

Results:

Participation in the "17th International Multidisciplinary Scientific GeoConference SGEM 2017 (Varna, Bulgaria)".

Peer revision of article submitted to journal: Bulletin of Engineering Geology and the Environment.

Participation in the organization of scientific events:

- "XII Congresso dos Jovens Geocientistas", Departamento de Ciências da Terra, Universidade de Coimbra. Comissão Científica e de Organização.

- "Universidade de Verão 2017 (UV2017)", Departamento de Ciências da Terra, Universidade de Coimbra. Supervisão de evento científico: "As rochas são resistentes e duráveis?".

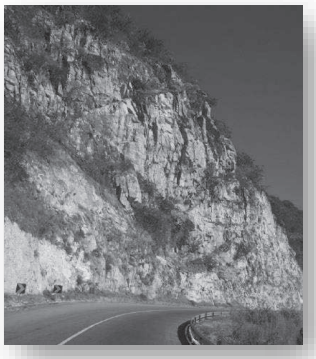
- "XII Bienal de la Real Sociedad Española de Historia Natural", Coimbra (Portugal). Comissão de Organização.

Submission and publication of articles, book chapters and books.

Supervision of Master of Science in Geological and Mining Engineering, conclued in 2017:
Costa, D.M.N. (2017) - Coimbra's Area Slope Assessment. Departamento de Ciências da Terra, Faculdade de Ciências e Tecnologia da Universidade de Coimbra, 106 p.

Supervision of Master of Science in Geoscience, conclued in 2017:

Gomes, L. (2017) - Leba's Sierra Slope Assessment (SW Angola). Departamento de Ciências da Terra, Faculdade de Ciências e Tecnologia da Universidade de Coimbra, 58 p.



Slope located on National Road 280 (SW Angola) (from Andrade et al., 2017).

Outputs:

Book chapters

1. Andrade, P. S.; André, I.; Callapez, P. M., 2017. Stability Assessment of Road Slopes, SW Angola. In: SGEM (Ed.), "Surveying Geology & Mining Geology Management 2017", Bulgaria, pp. 785-792, DOI: 10.5593/sgem2017/12/S02.100.

Articles

1. Andrade, P. S.; Quinta-Ferreira, M., 2017. The Geological-Geotechnical Cartography Applied to Geotechnics. Examples of Application in Portugal. *Memorias de la Real Sociedad Española de Historia Natural*, Segunda época, Tomo XIV, pp. 193-207.

Communications

1. Andrade, P. S.; Segundo, M.; Callapez, P. M., 2017. Erosão Costeira e Movimentos de Instabilidade de Arribas na Área do Cuio (Benguela, Angola), XXII Bienal de la Real Sociedad Española de Historia Natural (RSEHN), Coimbra, Abstract Book, pp. 206-208.

2. André,I. T.; Callapez, P. M.; Andrade, P. S.; Brandão, J. M., 2017. O Museu Regional do Dundo e as Potencialidades do Património Natural da Lunda-Norte (NE Angola), XXII Bienal de la Real Sociedad Española de Historia Natural (RSEHN), Coimbra, Abstract Book, pp. 301-303.

3. Narciso J.; Andrade, P. S., 2017. Análise de suscetibilidade geotécnica em Coimbra, XXII Bienal de la Real Sociedad Española de Historia Natural (RSEHN), Coimbra, Abstract Book, pp. 252-253.

Separation of plastic mixtures using mineral processing techniques

Fernando Antunes Gaspar Pita[1] and Ana Maria Castilho[1]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; fpita@dct.uc.pt; amcastil@dct.uc.pt

Project type: Resaerch and Innovation

Leaders: F. A. G. Pita and A. M. Castilho

Coordination: F. A. G. Pita and A. M. Castilho

Team: F. A. G. Pita and A. M. Castilho

Instituitions involved: Geosciences Center of the University of Coimbra

Goals: Over the recent years we have been doing research on the application of some separation methods used in mineral processing engineering, such as froth flotation and gravity separation (jigging) to the separation of plastic mixtures into their individual components.

Results: Participation in the). XXII Bienal de la Real Sociedad Espanola de Historia Natural – Los Mapas de la Natureza. Coimbra, Portugal. Participation in the XXIV Congresso Nacional de Criminalística, Florianópolis - Santa Catarina. Submission and publication of articles and abstracts.

Plastic Mixtures	Products	Recovery (%)		Grade (%)		Separation Efficiency (SE) (%)
		PS	OP*	PS	OP*	
PS/PMMA	Floated	89.62	25.1	78.13	21.87	64.5
	Non-Floated	10.38	74.9	12.17	87.83	
PS/PET-S	Floated	89.13	15.46	85.22	14.78	73.67
	Non-Floated	10.87	84.54	11.40	88.60	
PS/PET-D	Floated	94.50	14.950	86.34	13.66	79.55
	Non-Floated	5.50	85.05	6.07	93.93	
PS/PVC-M	Floated	95.89	5.62	94.46	5.54	90.27
	Non-Floated	4.11	94.38	4.17	95.83	
PS/PVC-D	Floated	88.20	13.22	86.970	13.03	74.98
	Non-Floated	11.80	86.78	11.970	88.03	

OP* denotes the other plastics, namely PMMA, PET-S, PET-D, PVC-M or PVC-D.

Results of the flotation tests on the mixtures of PS with PMMA, PET-S, PET-D, PVC-M and PVC-D (Pita &Castilho, 2017). For bi-component mixtures of plastics that join a high hydrophobicity plastic, like PS, and a low hydrophobicity plastic, like PMMA, PET-S, PET-D, PVC-M, or PVC-D, the quality of the flotation separation was always above 64%. The quality of the separation varied with the mixture type and depended not only on the hydrophobicity, but also on the size, density and shape of the particles, i.e. depended on the particle weight.

Plastic Mixtures	Products	Recovery (%)		Grade (%)		Separation Efficiency (%)
		PS	OP*	PS	OP*	
PS/PMMA	Floated	99.6	16.9	85.5	14.5	82.7
	Non-Floated	0.4	83.1	0.5	99.5	
PS/PET-S	Floated	99.4	21.3	82.4	17.6	78.1
	Non-Floated	0.6	78.7	0.8	99.2	
PS/PET-D	Floated	99.5	14.4	87.4	12.6	85.1
	Non-Floated	0.5	85.6	0.6	99.4	
PS/PVC-M	Floated	99.5	28.4	77.8	22.2	71.1
	Non-Floated	0.5	71.6	0.7	99.3	
PS/PVC-D	Floated	99.5	27.3	78.5	21.5	72.2
	Non-Floated	0.5	72.7	0.7	99.3	

OP* denotes the other plastics, namely PMMA, PET-S, PET-D, PVC-M or PVC-D.

Results of the jigging tests on the mixtures of PS with PMMA, PET-S, PET-D, PVC-M and PVC-D. (Pita &Castilho, 2017). For bi-component mixtures of plastics that join a low density plastic (like PS) and a high density plastic (like PMMA, PVC-D, PVC-M, PET-D and PET-S), the quality of the jigging separation was always over 70%. The PS grade in the sunk was less than 1% for all the plastic mixtures. The separation efficiencies varied with the mixture type and with the density, size and shape of the particles.

Outputs:

Articles

1. Pita, F.; Castilho, A., 2017. Separation of plastics by froth flotation. The role of size, shape and density of the particles. Waste Management, 60; 91-99. https://doi.org/10.1016/j.wasman.2016.07.041

2. Pita, F., 2017. Influence of froth height in column flotation of kaolin ore. Minerals, 7, 235, 1-13. doi:10.3390/min7120235.

Communications

1. Gomes, J.; Pita, F.; Castilho, A., 2017. Seleção de áreas potenciais para a implantação de um aterro de RSU. O caso de Lobito (Angola). XXII Bienal de la Real Sociedad Espanola de Historia Natural – Los Mapas de la Natureza (ed. Alfredo Dias, Fernando Barcenilla, Pedro Callapez), Coimbra, 6-9 Setembro 2017; 232-234.

2. Menezes, L. M.; Paradela, L. F.; Pita, F. A.; Costa, T. C., 2017. Perícia criminal ambiental realizada em um lixão municipal no estado do Pará. XXIV Congresso Nacional de Criminalística, Florianópolis - Santa Catarina, 2-6 of October, 2017.

Building Stone

Luís Sousa[1]

(1) Geosciences Centre of the University of Coimbra, Department of Earth Sciences of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; lsousa@utad.pt

(2) Universidade de Trás-os-Montes e Alto Douro, Quinta de Prados, 5000-801 Vila Real, Portugal.

Project type: Research and Innovation

Leaders: Luís Sousa

Coordination: Luís Sousa

Team: Luís Sousa

Instituitions involved: Geosciences Center of the University of Coimbra

Goals:

Results: Coordination of Ação Luso-Alemã n.º A-50/16 - Anisotropia microtextural (nanotextural) de mármores e granitos: Implicações na deterioração da pedra utilizada na construção. Years: 2016-2017. Partcipants: UTAD, UE, Univ. Gottingen.

Outputs:

Articles

1. Sousa, L.; Barabasch, J.; Stein, K-J.; Siegesmund, S., 2017. Characterization and quality assessment of granitic building stone deposits: A case study of two different Portuguese granites. Engineering Geology 221, 29–40. http://dx.doi.org/10.1016/j.enggeo.2017.01.030.

2. Sousa, L. M. O., 2017. Current approaches in the research of dimension stones: from quarry to heritage. Adv Geo Sci, Vol. 2. p 1-4. DOI: http://dx.doi.org/10.21065/.

3. Yarahmadi, R.; Bagherpour, R.; Tabaei, M.; Sousa, L. M. O., 2017. Investigation of intact rock geomechanical parameters' effects on commercial blocks' productivity within stone reserves: A case history of some quarries in Isfahan, Iran. *Journal of African Earth Sciences*, 134, 383-388.

4. Yarahmadi, R.; Bagherpour, R.; Taherian, S-G.; Sousa, L. M. O. A new quality factor for the building stone industry: a case study of stone blocks, slabs, and tiles. Bull Eng Geol Environ. DOI 10.1007/s10064-017-1040-5. (*in press*).

5. Yarahmadi, R.; Bagherpour, R.; Khademian, A.; Sousa, L. M. O.; Almasi, S. N.; Esfahani, M. M. Determining the optimum cutting direction in granite quarries through experimental studies: a case study of a granite quarry. Bull Eng Geol Environ. DOI 10.1007/s10064-017-1158-5. (*in press*).

SECTION 3

QUATERNARY, HUMAN ADAPTATIONS AND LANDSCAPE MANAGEMENT

Humans are part of evolution, adapting and, in such process, transforming, their contexts. But such transformative processes are actually unequal, operating at different levels, from moments of fast change to times of near immobility, from phases of growing interaction and intensification to stages of segregation, from sequences of apparent equilibrium to disruptive events. Humans are not different from other living species, or from rocks, in that respect, even if time and space scales might be distinct.

The core of research on human adaptations throughout the quaternary, within CGEO, is to assess human transitions, focusing on the relation between resources, their transformation, the related logistics, the social access to knowledge and products and the cultural understandings of all these processes. Geosciences (geoarchaeology, dating, etc.) seat as the backbone of such a research strategy that builds into paleotechnology, paleoeconomy, paleoecology and paleoethnology, these allowing for then bridging with contemporary concerns on landscape management and sustainability.

As a result, our research privileges the integrated study of territories, and, within them, of resources, technologies (on lithics, ceramics, metals, organic materials), their results (from tools to rock art, dwelling or food) and the mechanisms of sociocultural exchange and transformation of knowledge and products. Because we know that human behavior varies beyond the variability of resources and other contextual variables, CGEO engages in comparative assessments in different continents. Ongoing projects are undertaken by our Centre in Europe, Latin America, Africa and Asia.

This allows to identify common structural approaches despite cultural differences: from the assessment of Pleistocene and Holocene macrolithic industries of the Tagus and Uruguay valleys, to the importance of the representation of deers in the art of societies in transition to production economies in southern Europe and northeast Brazil, or to the function of rock art in the landscapes of the Iberian peninsula and the Ebo valley in Angola. From this, we discuss main structural drivers of human transitions, which are of use for contemporary landscape management projects. This is why we have engaged in heritage management and museography, but also into the cooperation with international projects like CIPSH-UNESCO World Humanities Conference, the International Year of Global Understanding or the UNESCO project on Broadening Sustainability Science.

Research will pursue in the years, attempting to improve knowledge on past societies, developing new models of heritage management and education, and pursuing to resume a central role for such a humanities&geosciences integration for landscape sustainable development.

Luiz Oosterbeek

Quaternary and Prehistory former Group of CGEO (UID/Multi/00073/2013)

Luiz Oosterbeek[1]

(1) Polytechnic Institute of Tomar, Estrada da Serra, Campus da Quinta do Contador, 2300-313 Tomar, Portugal. Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal. Earth and Memory Institute, Largo infant D. Henrique, 6120-750 Mação, Portugal; nelsonjalmeida@gmail.com; loost@ipt.pt

Project type: Research and Innovation

Leader: Luiz Oosterbeek

Coordination: Luiz Oosterbeek

Team: Luiz Oosterbeek, Pierluigi Rosina, Hipólito Collado, Luís Santos, Sara Cura, Alexandra Figueiredo, Silvério Figueiredo, Davide Delfino, Fernando Coimbra, George Nash, Rita Anastácio, André Soares, Stefano Grimaldi, Nelson Almeida, Cristiana Ferreira, Sara Garcês, Hugo Gomes, Tiago Tomé, Jedson Cerezer, Dragos Gheorgiu, Erika Robrhán, Pedro Cunha, Juliano Campos, Pedro Cura, Fabio Carbone, Marian Rodrigues, Milena Reis, Palmira Saladié, Tânia Tomázia, Anna Tallarita, Ziva Domingos, Ana Cunha, Carlos Rodriguez, Daniela Matos, Dario Sigari, Elaine Inácio, Graziea Jácome, Hamilton Fernandes, Henrique Mourão, Jorge Cristóvão, Laurent Caron, Maria Nicoli, Marcos Santos, Rosa Nico and Vera Moleiro

Instituitions involved: Instituto Politécnico de Tomar, Instituto Terra e Memória

Goals: The Quaternary and Prehistory Group is a research team focused on prehistoric human adaptations to environmental and climatic changes. Within the science framework, it takes a geosciences dominant approach, and privileges the interpretation of the archaeological record from the methodological advances of earth and life sciences, although considering the relevance of humanities. In this respect, it converges with a more processual and science driven approach to the past, even if it takes into consideration relevant contributions of postprocessual studies.

The interests of the group all converge into three major clusters: territory (landscape archaeology); technology (reconstruction of operational chains); integrated landscape management as the flexible behavioral framework of successful groups in the past and in the present. 35 different specific actions, in 10 countries from 3 continents, relate to these. A UNESCO chair on “Humanities and Cultural Integrated Landscape Management”, endorsed by the International Council for the Philosophy and Human sciences and related to the UNESCO programme MOST (Management of Social Transformations) has been proposed and is expected to be launched in 2018. Bringing together geosciences, life

sciences and humanities through a long-term approach to transition processes, throughout the Quaternary, is the scope of the chair

Results:

- Characterization of the relevance of dry climatic oscillations in the dawn of food production;
- Reassessment of the Neolithic process in the Tagus basin on the basis of taphonomic and zooarchaeological analysis;
- Characterization of the environmental evolution of the Tagus basin in the middle Holocene;
- Contributions for sequencing soil occupation strategies, in Brazil;
- Characterization of patterns of mobility of Guarani groups on the basis of ceramic studies, in Brazil;
- Geo-archaeological study of the megalithic monuments from Alto Ribatejo, Portugal;
- Definition of a gradient of penetration defining the differential occupation of space deriving from physiographic and cultural constraints;
- Characterization of the lithic technology in the shell middens of Santa Catarina, Brazil;
- Identification of the technomorphological characteristics of Iron Age knives with twisting blade in the Alpine region;
- Characterization of the relations between the granitic rock art and the Iron age settlement patterns in Citânia de Briteiros, Portugal;
- Characterization of sequence of occupations and rock art in Tocantins, Brazil;
- Interpretative model on the significance of deer representations in the Tagus basin rock art, Portugal;
- Sequencing of the human occupations and rock art of the Ebo plateau in Angola;
- Sequencing of rock art and human settlement in Erongo, Namibia;
- Characterization of non-organic pigments and operational chains in the Iberian and African rock art;
- Reconstruction of the industrial iron operational chain in relation to the geological context of Minas Gerais;
- Definition of a comprehensive model for cultural integrated landscape management, and its testing in Portugal and Brazil;
- Definition of a model of management of African rock art world heritage sites, taking as an example Twyfelfontein, in Namibia;
- Definition of a framework for the legal protection of archaeological collections in the context of global trade;
- Several specific other projects in Portugal, Spain, Greece, Mongolia, Belgium, Ethiopia, Angola, Cabo-Verde, Tanzania, Brazil, Colombia, China, Malaysia.

Visit to an exhibition at ITM, Mação.

Scene from the dissemination video "Hands from the Past".

Education on experimental archaeology.

Outputs:

Note: There is a very wide series of publications. A brief selection is indicated bellow, with incomplete bibliographic references.

Edited books

1. Delfino, D.; Oosterbeek, L.; Garcês, S. (eds.), 2017. *Há 70 anos: o Castelo Velho do Caratão.*

2. Garcês, S., Collado Giraldo, H. et al., 2017. *XIX International Rock Art Conference IFRAO 2015*.

3. Garcês, S.; García Arranz, J. J. et al. (coords.), 2017. *Las Manifestaciones gráficas rupestres en el dólmen de Soto (Trigueros, Huelva)*.

4. Garcês, S.; Gomes, H. et al., 2017. *IV ASP, A Arte das Sociedades Pré-Históricas.*

5. Oosterbeek L.; Gudauskas R.; Caron L. (eds.), 2017. *Education, training and communication in cultural management of landscapes.*

6. Oosterbeek, L.; Fiorillo, C. A. P. (eds.), 2017. *II Congresso Luso-Brasileiro de Direitos Humanos e Sociedade da Informação.*

7. Oosterbeek, L.; Werlen, B.; Caron, L. (eds.), 2017. *Sociocultural matrices.* (3 vols.)

Book Chapters

1. Almeida, N.; Saladié, P. et al., 2017. A arqueofauna do Neolítico antigo (…).

2. Garcês, S.; Collado Giraldo, H. et al., 2017. Catálogo de manifestaciones gráficas pintadas (…).

3. Gomes, H.; Rosina, P. et al., 2017. Análisis de los pigmentos del dólmen de Soto (…).

4. Oosterbeek, L., 2017. Encrypting and decrypting territories: (…).

5. Oosterbeek, L., 2017. *Kóios* and *Phoïbe*: knowledge through sociocultural matrices (…).

6. Tomé, T. ; Cunha, C. et al., 2017. Assessing spatial dispersion of human remains (…).

7. Oosterbeek., L.; Werlen, B. et al., 2017. Apheleia. Building an European strategic (…).

Articles

1. Oosterbeek, L., 2017. From Heritage into the Territory *Territori della Cultura*, 29.

2. Szécsényi-Nagy, A. et al., 2017. The maternal genetic make-up of the Iberian Peninsula between the Neolithic and the Early Bronze Age. *Nature – Scientific Report*s, 7.

3. Tomé, T.; Silva, A. M.; Collado et al., 2017. Prehistoric trepanation (…) *Antropologia Portuguesa*, vol. 32.

Thesis

PhD thesis: 9 in 2015, 4 in 2016; 9 in 2017; ongoing 8 thesis.

PhD programmes: Quaternary and Prehistory (Erasmus Mundus), Heritage (Univ. of Extremadura and Córdoba), Environmental Management (Cape Vert).

Proceedings

1. Almeida, N.; Ferreira, C. et al., 2017. The Western network revisited: (…). in *Proceedings of the XVII UISPP World Congress*

2. Cura, S.; Oosterbeek, L., 2017. Museu de Mação (…) *Há 70 anos: o Castelo Velho* (…).

3. Cura, S.; Pedergnana, A. et al., 2017. Estudo tecnológico de três (…) in *Arqueologia em Portugal. 2017*

4. Garcês, S. ; Gomes, H. et al., 2017. Uma abordagem "multi-proxy" (…) in *Arqueologia em Portugal. 2017*

5. Oosterbeek, L., 2017. A diversidade das paisagens (…) in *II Congresso Luso-Brasileiro de Direitos Humanos e Sociedade da Informação*

6. Oosterbeek, L. ; Pereira, A. et al., 2017. Para além da Gestão Patrimonial (…) in *Arqueologia em Portugal. 2017*

7. Ferreira, C.; Almeida, N. J. et al., 2017. Environmental and climate changes during Little Ice Age (…) in *1st International Meeting Histories of Nature and Environments*

8. Oosterbeek, L., 2017. At the Dawn of Writing (…) In *The 7th IEL International Seminar on Epic Studies and Oral Tradition* (…).

9. Oosterbeek, L., 2017. Conservation, Migrations (…) in *International Conference "Great Migrations in Ancient Asia Minor…"*

10. Oosterbeek, L., 2017. From Sites to Narratives(…) In *The 7th IEL International Seminar on Epic Studies and Oral Tradition* (…).

Global History of Humankind

Luiz Oosterbeek[1, 2]

(1) Geosciences Centre of the University of Coimbra, ITM – Earth and Memory Institute, Largo dos Combatentes 6120-725, Mação.
(2) Polytechnic Institute of Tomar, Estrada da Serra, Campus da Quinta do Contador, 2300-313 Tomar, Portugal; loost@ipt.pt

Project type: International Research project

Leaders: Laurent Tissot, Luiz Oosterbeek et al

Team: The whole team of CGEO will be involved

Institutions involved: International Council for the Philosphy and Human Sciences, Earth and Memory Institute (ITM); Geosciences Center of the University of Coimbra (CGeo – UC), all academic world research federations affiliated to CIPSH

Goals: The necessity to write Global History or Transnational History came largely in response to the impacts of globalization and to the emerging questioning of the ethnocentric perspectives of history, attempting to show why and how major historical events are often interconnected, but also how different theoretical approaches are not to be confused with mere opinions, distinguishing history and memory, encompassing the contributions of all humanities for a multidisciplinary understanding of the past and its relations with present and future sociocultural processes.

A Global History of Humanity requires the possibility of multiple approaches. Certainly, those based in chronology, on disciplinary expertise, or on the different regions in the world, but also those thematic (adaptations to coastal environments or deserts; the role of techniques or beliefs; the relevance of oral tales, imaginary and narratives in the perception and running of societies; the notions of reality, self, other, individual or kin; the role of Diasporas, the history of debates on ethics or logic, and their tangible and intangible implications; etc.).

A GHH is, today, a task that requires all scholars from the Humanities, but also natural scientists and other experts interested in the origin and meaning of their fields of expertise, to be engaged.

In this sense, the task of history is not, today, only a task of historians. It requires the joint involvement of the different disciplines of the humanities, converging their perspectives and epistemological frameworks into the construction of a common past of humanity, which, to be so, must be plural but not relativistic, diverse but not chaotic. No longer a collection of ethnocentric stories, but a Global History of Humanity.

Rock art: historical contextualization of geological, environmental and cultural processes. This picture: the carved horse from the Ocreza valley, Tagus basin, Mação, Potugal (Upper Palaeolithic).

Outputs:

Articles

1. Oosterbeek, L.; Crowley, J.; Go Okui, CIPSH and UNESCO, 2017. *Challenges and Responsibilities for a Planet in Transition. Proceedings of the World Humanities Conference, Liège, Belgium, 6-11 August 2017*. Paris, Mação: CIPSH-UNESCO. ITM editions, pp.243-252.

Apheleia - Integrated Cultural Landscape Management for Local and global sustainability (European Commission 2014-1-PT1-KA203-001082)

Luiz Oosterbeek[1]

(1) Polytechnic Institute of Tomar, Estrada da Serra, Campus da Quinta do Contador, 2300-313 Tomar, Portugal. Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal. Earth and Memory Institute, Largo infant D. Henrique, 6120-750 Mação, Portugal; loost@ipt.pt

Project type: Strategic Partnership for Research and Innovation

Leader: Luiz Oosterbeek

Coordination: Luiz Oosterbeek, Benno Werlen and Renaldas Gudauskas

Team: Luiz Oosterbeek, Benno Werlen, Renaldas Gudauskas, Pierluigi Rosina, Luís Santos, Laurent Caron, Sara Cura, Nelson J. Almeida, Davide Delfino, Anabela Pereira, André Soares, Marta Arzarello, et al.

Instituitions involved: Instituto Politécnico de Tomar, Friedrich Schiele University of Jena, Muséum National d'Histoire Naturelle, University of Vilnius, Universitá di Ferrara, Universidad de Extremadura, Brno Technical University, Université Jean Monet, CGEO, Vilnius National Library, Comunidade Intermunicipal do Médio Tejo, Município de Mação, ACINEP, Benefits & Profits, Centro Universitario Europeo per i Beni Culturali, Herity International, Instituto Terra e Memória, UNESCO-MOST

Goals: The strategic partnership Apheleia aims at structuring a convergent set of tools that will foster the need for a properly Integrated (as opposed to dispersed) Cultural (i.e. human and diverse) Landscape Management (rooted in human understandings and leading towards governance through awareness and critical thinking) for Local and Global Sustainability (addressing the great global dilemmas, but also focused on individual anxieties and needs).

Results:

- Three International specialized Seminars (2015, 2016, 2017) engaging over 300 shcolars and advanced research students from over 30 countries.
- 4 books and several papers.
- Almost 100 case-studies undertaken and published.
- Established partnership with UNESCO.
- Website with materials for wider use.
- Impact engaging over 25.000 scholars worldwide.
- Preparation of a UNESCO chair to be hosted by IPT with the support of ITM.
- Creation of a new International NGO.

Left: Study visit to the Tagus Geopark. Right: Laboratory work.

Outputs:

Books

1. Oosterbeek, L.; Werlen, B.; Caron, L. (eds.), 2017. *Sociocultural matrices. Transdisciplinary contributions to integrated cultural landscape management*. – Vol. 1 ITM, *série ARKEOS*, vol. 40, 250 p.

2. Oosterbeek L., Gudauskas R., Caron L. (eds.), 2017. *Education, training and communication in cultural management of landscapes. Transdisciplinary contributions to Cultural Integrated Landscape Management.* Mação: Instituto Terra e Memória, série *Arkeos*, vol. 42., 173 p.

Articles

1. Oosterbeek, L., 2017. A diversidade das paisagens culturais como direito humano fundamental In Oosterbeek, L.; Fiorillo, C.A.P. (eds. 2017). *II Congresso Luso-Brasileiro de Direitos Humanos e Sociedade da Informação.* Mação: Instituto Terra e Memória, série *Area Domeniu*, vol. 6, pp. 42-47.

HANDPAS Project

Hipólito Collado Giraldo[1]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; hipolitocollado@gmail.com

Project type: Resaerch; Innovation; Heritage

Leaders: Hipólito Collado, Luiz Oosterbeek and Dario Seglie

Coordination: Hipólito Collado

Team: Hipólito Collado, Luiz Oosterbeek and Dario Seglie

Instituitions involved: Junta de Extremadura (Spain), Instituto Terra e Memória (Portugal); CESMAP, Museo de Prehistoria de Pinerolo (Italy)

Goals: This project is designed to reach different goals. Among them, the most remarkable one is to make quality documental, graphic and theoretical information available for researchers (as well as for the general public) through a free access digital platform. To this aim, the basic element for data collection of the best European sites showing Paleolithic hands will be the use of 3D high resolution scanning technology.

Particular features of the heritage assets under research, which are always fragile and placed in caves with limited access or difficult to reach, are the ones leading to the proposed documentary method (because of its reliability and highly accurate details). Together with the solutions given for display and diffusion, it becomes a powerful tool for researchers who are focused on aspects related to hands representations in the rock art, so they can work remotely, overcoming physical barriers which may rise from access conditions as well as the preservation of the caves and its paintings.

Due to different technical, logistical and cultural factors, rock art seen as a link among the proposed European areas (in Spain, France and Italy) has never received the importance and cultural spread that it should worth.

In this way, this project intends to create a multimedia platform which allows rock art to become closer at the same time it performs graphical and metric research to contribute to its modernization and innovation.

The user is entering into a data base with quality graphic content where three-dimensional real models of panels with Paleolithic hands are shown in real-time and it is possible to interact with them thanks to different tools: 3D visualizer, measuring, directional light, digitally treated image; they are all integrated on the own website.

Following these aspects, HANDPAS is aimed to:

- develop a high definition documentation protocol totally friendly to rock art.
- launch an integrated data base also interrelated, able to help researchers to search details about Paleolithic hands representations.
- create a web environment for visualizing three-dimensional models and high-resolution images allowing real-time interaction with the information, available for researchers, curators, students and the general public.

Results:

- A scientific documentary HANDPAS;
- A set of digital documentation of several of caves in Europe with palaeolithic hand stencils with free access;
- A free digital platform; a data base with quality graphic content where three-dimensional real models of panels with Paleolithic hands are shown in real-time and it is possible to interact with them thanks to different tools: 3D visualizer, measuring, directional light, digitally treated image; they are all integrated on the own website;
- Worldwide interest;
- Second place in the II Festival of Archaeological Cinema of Castile and Leon, that took place between 5 and 7 of May in Zamora, Spain;
- http://handpas.juntaex.es/en/project/

https://vimeo.com/192912520.

Outputs:

https://www.dn.pt/lusa/interior/documentario-coproduzido-pelo-instituto-terra-e-memoria-ganha-premio-em-espanha-8466789.html

http://www.oribatejo.pt/2017/05/18/documentario-coproduzido-por-macao-foi-premiado-e-mostra-passado-pre-historico-da-peninsula-iberica/

https://www.em.com.br/app/noticia/internacional/2017/05/03/interna_internacional,866703/os-segredos-ocultos-das-maos-pintadas-na-europa-pre-historica.shtml

http://www.mediotejo.net/macao-documentario-coproduzido-por-instituto-terra-e-memoria-ganha-premio-internacional/

http://www.oribatejo.pt/tag/hand-pas-maos-do-passado/

https://www.rtp.pt/noticias/cultura/arqueologos-de-macao-recriam-tribo-pre-historica-em-documentario-rodado-em-espanha_n910912

http://museunacionaldearqueologia-educativo.blogspot.pt/2017/04/handpas-maos-do-passado.html

http://w3.ufsm.br/ccsh/index.php/home/noticias/441-filme-maos-do-passado-sera-exibido-dentro-da-programacao-do-cihis

http://www.antenalivre.pt/noticias/macao-itm-participa-num-documentario-sobre-arte-rupestre-pre-historica

http://www.rederegional.com/index.php/cultura/20187-documentario-premiado-no-centro-de-educacao-da-barquinha

https://www.efe.com/efe/portugal/estremadura/extremadura-usa-tecnologia-3d-num-projeto-internacional-sobre-arte-rupestre/50000446-3080027

http://www.antenalivre.pt/noticias/arqueologos-de-macao-recriam-tribo-pre-historica-em-documentario-rodado-em-espanha/

https://www.rtp.pt/noticias/cultura/documentario-coproduzido-pelo-instituto-terra-e-memoria-ganha-premio-em-espanha_n1000902

http://www.antenalivre.pt/noticias/vn-da-barquinha-a-pre-historia-em-destaque-no-ciec

A scientific documentary HANDPAS.

HANDPAS Project.

Mação – UNESCO Global Learning Cities Network

Luiz Oosterbeek[1, 2]

(1) Geosciences Centre of the University of Coimbra, ITM – Earth and Memory Institute, Largo dos Combatentes 6120-725, Mação; (2) Polytechnic Institute of Tomar, Estrada da Serra, Campus da Quinta do Contador, 2300-313 Tomar, Portugal
loost@ipt.pt

Project type: Knowledge socialization project and award

Leader: Vasco Estrela (Mayor of Mação), Luiz Oosterbeek (CGEO-IPT-ITM-Museum cluster), José António Almeida (pre-university education), Vanda Serra (Senior university), Rosário Wanon (Library)

Team: The whole team of the Centre, in Mação, contributes to the project

Institutions involved: Earth and Memory Institute (ITM); Polytechnic Institute of Tomar (IPT); Geosciences Center of the University of Coimbra (CGeo – UC)

Goals: Mação faces three scales of challenges: those shared by Portugal as a whole (need to diversify the economy; need to foster cultural diversity and sociocultural cohesion; need to counter the growing alienation of people; need to resume a central role of the Humanities in daily life; need to promote critical reasoning and the understanding of the dilemmas imposed in the context of global transformations; need to overcome the growing generation gaps); those related specifically to the inner regions of the country (ageing and exodus of population; loss of productive activities and, as a consequence, of jobs; loss of knowledge on traditional skills); those specific of Mação itself (related to its history, to its dominant and minority beliefs and to its traditional knowledge and economic opportunities).

Since 2001, Mação launched an ambitious project to promote its Museum and cultural and educational activities as a major priority. This would eventually grow into becoming one of the two pillars of development of the region (the other, also related to learning, being the forest and related activities). A learning strategy was identified as the only strategic way to prevent alienation and to foster the required critical reasoning that may allow our society to imagine an alternative and sustainable future. It took over a decade to fully structure such strategy, but we now have a dynamic of participation in a critical assessment of the collective challenges. Learning all time and throughout the whole live is what is fully understood, from pre-school to senior university people. The awards received by the different education and culture structures, but also for the local research on how to manage the forest or how to design dispersed aged population social care, illustrate this relation between learning, then

facing the dilemmas and solving the problems.

Monitorization and evaluation of the learning programmes in Mação is done through several mechanisms such as: the quality heritage certification of the Museum by the International HERITY; the integration of the Museum in the Portuguese Network of Museums; the awards given to the by the Portuguese Association of Museology to the educational resources and the internationalization; the Public School is permanently evaluated by the internal mechanisms of the Ministry of Education; the Geoscience Centre of which ITM is part was also evaluated by the Science and Technology Foundation and all the international projects funded by the European community are evaluated by external commissions.

The award was given from 2016.

Learning critical reasoning from pre-primary school

Fieldwork formation of Erasmus Mundus Master students

Outputs:

1. Almeida, N. J.; Scarre, C.; Cerrillo Cuenca, E.; Borralheiro, A.; Belo, J.; Costa, L.; Cura, P.; Ferreira, C.; Garcês, S.; Neves, C.; Oosterbeek, L., 2017. Novos trabalhos arqueológicos no Médio Tejo: o projecto "Tarefas em movimento através das formas: a dispersão agro-pastoril para e a partir do Alto Ribatejo". *Online Al-Madan (submitted).*

UNESCO chair on Humanities and Cultural Integrated Landscape Management

Luiz Oosterbeek[1, 2]

(1) Geosciences Centre of the University of Coimbra, ITM – Earth and Memory Institute, Largo dos Combatentes 6120-725, Mação; (2) Polytechnic Institute of Tomar, Estrada da Serra, Campus da Quinta do Contador, 2300-313 Tomar, Portugal
loost@ipt.pt

Project type: Academic chair

Leaders: Luiz Oosterbeek

Team: Alexandra Figueiredo, Ana Paula Machado, Cristina Andrade, Fernando Coimbra, Gabriel Pires, George Nash, Hália Santos, Hermínia Sol, Hipólito Collado, Laurent Caron, Luís Mota Figueira, Luís Santos, Pierluigi Rosina, Rita Ferreira Anastácio, Rosa Nico, Silvério Figueiredo, Sónia Gonçalves, Teresa Desterro

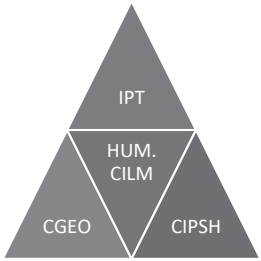
Institutions involved: Polytechnic Institute of Tomar (IPT - coordinator); Earth and Memory Institute (ITM); Geosciences Center of the University of Coimbra (CGeo – UC), UniFe – Universitá degli Studi di Ferrara, Italy – Prof. Carlo Peretto (Human evolution, link with another UNESCO chair being proposed), Muséum National d'Histoire Naturelle France, University of Jena Germany, Catalan Institute of Human Paleoecology and Social Evolution, Universitat Rovira I Virgili Tarragona Spain, Universidad de Extremadura, Spain, Université Jean Monet de St. Etienne France, Technical University of Brno, Universidade Federal de Santa Maria Brazil, Chinese University of Hong-Kong, Université Cheikh Anta Diop Dakar Sénégal, Universidade de Cabo Verde, Chinese Academy of Social Sciences, Federal University of Minas Gerais, Sri Venkateswara College - University of Delhi India, University of Pennsylvania USA

Goals: In the process of the re-organisation of the humanities research, education and social implications on a global scale, an ongoing effort is underway to promote stronger collaboration among UNESCO chairs of humanities, also involving CIPSH, including the establishment of new UNESCO chairs on specific themes which are of relevance for contemporary society.

The main aims of the chair are: consolidation of the already existing network; education and best practices for students' applied training in transdisciplinary innovative approaches to integrated cultural landscape management; yearly Intensive Seminars on Integrated Cultural Landscape Management for Local and global sustainability, rooted on in academic knowledge and in regional authorities co-operation; to undertake Humanities comparative studies in the field of sustainability; to publish essays,

proceedings and media based materials. The specific short-term objectives of the chair are four: The establishment of a global research, education and innovation network, that will be able to generate new knowledge, to foster its application in real contexts and to communicate the outcomes and outputs; To demonstrate the specific use of the Humanities in daily life, namely by re-introducing mid and long term reasoning in society agendas and by stressing the need to integrate problem-solving activities within dilemma-facing strategic agendas that may make sense for people; To potentiate the impact of knowledge production and knowledge sharing for overcoming the difficulties of society, particularly making use of digital and geo-referenced tools, participative science and a network of territories of applied tools; To educate new generations of qualified leaders within a transdisciplinary and creative framework, that will also allow humanities to directly connect with natural and formal sciences, technology and the arts.

Chair logo



Structure of collaboration

Outputs:

www.mediotejo.net/macao-ipt-tera-catedra-da-unesco-ja-em-2018-cvideo/

Moving tasks across shapes: the agro-pastoralists spread towards and from the Alto Ribatejo (PTDC/EPH-ARQ/4356/2014 - 2016-2019)

Nelson J. Almeida[1] and Luiz Oosterbeek[1]

(1) Polytechnic Institute of Tomar, Estrada da Serra, Campus da Quinta do Contador, 2300-313 Tomar, Portugal. Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal. Earth and Memory Institute, Largo infant D. Henrique, 6120-750 Mação, Portugal; nelsonjalmeida@gmail.com; loost@ipt.pt

Project type: Research and Innovation

Leader: Luiz Oosterbeek

Coordination: Luiz Oosterbeek and Nelson J. Almeida

Team: César Neves, Chris Scarre, Cristiana Ferreira, Darko Stojanovski, Davide Delfino, Enrique Cerrillo Cuenca, Ethel Allué, Fernando Coimbra, Francesc Burjachs, Hugo Gomes, Hipólito Collado Giraldo, João Belo, Lídia Catarino, Luís Costa, Luiz Oosterbeek, Mário Ferreira, Nelson J. Almeida, Palmira Saladié Ballesté, Pedro Cura, Pierluigi Rosina, Rita Anastácio, Rui Pena dos Reis, Sara Cura, Sara Garcês and Stefano Grimaldi

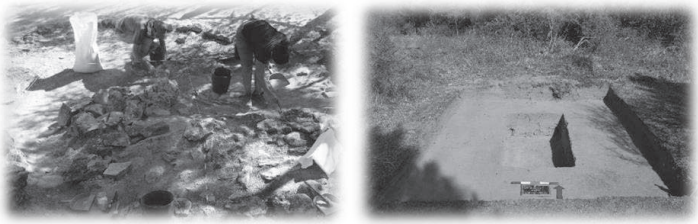
Instituitions involved: Instituto Terra e Memória, Grupo Quaternário e Pré-História (Geosciences Centre of the University of Coimbra), Instituto de Arqueologia de Mérida, Instituto de Estudios Prehistóricos, Instituto Politécnico de Tomar, Università degli studi di Trento, University of Durham

Goals: The project intends to study the last hunter gatherers and first productive economies of the Alto Ribatejo (central Portugal) in its relation to surrounding areas. Main objectives are the analysis of settlement patterns (field surveys, GIS, online publicly available Geoportal), stratigraphic revision and acquisition of new data (excavation of known and new sites), lithic economies (raw material provenance studies, techno-functionality) and peopling characterization (transdisciplinary study of sites and materials, palaeogenetic and dietary studies).

Results:

- Existing data review for the Early and Middle Holocene (physical, theoretical and practical dimensions of the project) of Alto Ribatejo and inter-regional comparisons.
- Validation of existing and new data, GIS modelation, creation of a geographical database, online Geoportal and technical report.
- Intensive field surveys done in Abrantes, Constância and Mação, with known sites relocation and identification of new surface scatters.
- Archaeological interventions in Anta 1 de Vale da Laje (Tomar) and Salvador (Abrantes) sites.

- Dissemination of preliminary results for both specialists and general public, through submission and publication of articles and book chapters, newspapers and mass media, on-site visitations and participation in events.



Left: Detail of the archaeological intervention on the peripheral stone structures of Anta 1 de Vale da Laje.
Right: General view of the Salvador archaeological excavation in the initial moments of open area intervention.

Outputs:

Articles

1. Szécsényi-Nagy, A. *et al.* The maternal genetic make-up of the Iberian Peninsula between the Neolithic and the Early Bronze Age. *Scientific Reports – Nature* (*in preparation*).

2. Almeida, N. J.; Scarre, C.; Cerrillo Cuenca, E.; Boralheiro, A.; Belo, J.; Costa, L.; Cura, P.; Ferreira, C.; Garcês, S.; Neves, C.; Oosterbeek, L., 2017. Novos trabalhos arqueológicos no Médio Tejo: o projecto "Tarefas em movimento através das formas: a dispersão agro-pastoril para e a partir do Alto Ribatejo". *Online Al-Madan (submitted).*

3. Oosterbeek, L., 2017. From Heritage into the Territory: agendas for an unforeseeable future. *Territori della Cultura*. Centro Universitario Europeo per i Beni Culturali (*in press*).

4. Nash, G.; Garcês, S., 2017. The relevance of watery soundscapes in a ritual context. *Time & Mind*, 10(1), pp. 69-80.

Book Chapters

1. Oosterbeek, L., 2017. The 21st century agenda of modernisation: a Humanities challenge. In Floresta, M. das G. (ed.). Universidade Federal de Viçosa, Viçosa, Brasil. (*in press*)

2. Oosterbeek, L., 2017. *Kóios* and *Phoïbe*: knowledge through sociocultural matrices, in the framework of cultural integrated landscape management and sustainability science. In Oosterbeek, L.; Werlen, B.; Caron, L. (eds.), *Sociocultural matrices. Transdisciplinary contributions to integrated cultural landscape management*. – Vol. 1. ITM, ARKEOS, vol. 40, pp. 45-64.

Proceedings

1. Cristóvão, J.; Almeida, N. J.; Anastácio, R.; Oosterbeek, L., 2017. Where do we go now? Primeiros passos na construção de um geoportal arqueológico para o Alto Ribatejo. Actas XIII JIAP – Jornadas Iberoamericanas de Arqueologia e Património em Portugal. Museu de Arte Pré-Histórica de Mação, 27-28 March, 2017. Org. MAP, ITM, CMM, CGeo. Techné. *(in press).*

2. Oosterbeek, L.; Borralheiro, A.; Defino, D.; Inácio, E.; Mourão, H.; Nicoli, M.; Rodrigues, M. H.; Almeida, N. J.; Rosina, P.; Anastácio, R.; Cura, P.; Cura, S.; Garcês, S., 2017. Para além da gestão patrimonial: uma nova relação da arqueologia com o território. Actas do II Congresso da Associação dos Arqueólogos Portugueses. Lisboa, Novembro de 2017. Org. AAP, FCSH, UL, FLUL.

3. Almeida, N. J.; Saladié, P.; Cerrilo Cuenca, E.; Leitão, E.; Oosterbeek, L., 2017. A Arqueofauna do Neolítico antigo da Encosta de Sant'Ana (Lisboa). In Senna Martinez, J. C.; Martins, A. C.; Ávila de Melo, A.; Caessa, A.; Marques, A.; Cameira, I., Diz-me o que comes…alimentação antes e depois da cidade. Fragmentos de Arqueologia de Lisboa 1. CML, DMC, DPC, CAL, SGL. Lisboa, pp. 25-40.

4. Almeida, N. J.; Ferreira, C.; Garcês, S.; Cruz, A.; Rosina, P.; Oosterbeek, L., 2017. The Western network revisited: the transition into agro-pastoralism in the Alto Ribatejo, Portugal. In Besse, M., Guilaine, J., Materials, production, exchange network and their impact on the societies of Neolithic Europe. Proceedings of the XVII UISPP World Congress. Volume 13/Session A25a. Oxford: Archaeopress Archaeology, pp. 39-49.

5. Almeida, N. J.; Saladié, P.; Cerrillo Cuenca, E.; Oosterbeek, L., 2017. Understanding Neolithic leporid accumulations: the examples of Cadaval and Nossa Senhora das Lapas caves (Tomar, Middle Tagus, Portugal). In Valente, M.J., Costa, C., Detry, C., Book of abstracts - Encontro de Zooarqueologia Ibérica (EZI2017) – 5ª Reunião Científica de Arqueomalacologia da Península Ibérica (5RCAPI), 26-29 Abril 2017, Universidade do Algarve, Faro, pp 12-13.

PhD Thesis

1. Almeida, N. J., 2017. *Zooarqueologia e Tafonomia da transição para a agro-pastorícia no Baixo e Médio Vale do Tejo*. PhD in Quaternary, Materials and Cultures. UTAD, Vila Real.

2. Ferreira, C., 2017. *Dinâmicas Ambientais e Humanas durante o Holocénico no Vale do Tejo*. PhD in Quaternary, Materials and Cultures. UTAD, Vila Real.

3. Garcês, S., 2017. *Cervídeos: Símbolos e Sociedade nos primórdios da Agricultura no Vale do Tejo*. PhD in Quaternary, Materials and Cultures. UTAD, Vila Real.

4. Stojanovski, D., 2017. *Neolithic pottery characterisation from two regions in the Iberian hinterland.* PhD in Quaternary, Materials and Cultures. UTAD, Vila Real.

Communications

1. Oosterbeek, L.; Borralheiro, A.; Defino, D.; Inácio, E.; Mourão, H.; Nicoli, M.; Rodrigues, M. H.; Almeida, N. J.; Rosina, P.; Anastácio, R.; Cura, P.; Cura, S.; Garcês, S., 2017. Para além da gestão patrimonial: uma nova relação da arqueologia com o território. II Congresso da Associação dos Arqueólogos Portugueses. Lisboa, Novembro de 2017. Org. AAP, FCSH, UL, FLUL.

2. Oosterbeek, L.; Scheunemann, I.; Rosina, P., 2017. Gestão de Territórios e Desenvolvimento Social: integração das geociências com as humanidades. Encontro com a Ciência e Tecnologia em Portugal, Ciência'17. Centro de Congressos de Lisboa, 03-05 de Julho.

3. Almeida, N. J., 2017. Tafonomia aplicada a estudos arqueofaunísticos. Teoria e exemplos do Baixo e Médio Vale do Tejo. Z3, Aulas Abertas. Seminário de Introdução à Zooarqueologia. Mestrado em Arqueologia, Faculdade de Letras da Universidade de Lisboa. Org. UNIARQ, FLUL, UL. Lisboa, 25 de Maio de 2017.

4. Almeida, N. J., 2017. Knowledge and sustainability in early farming societies. Education, training and communication in cultural management of landscapes. Apheleia – Cultural Integrated Landscape Management for Sustainable Development and Global Understanding. Centro Cultural Elvino Pereira, Mação, 29 March – 8 April, 2017.

5. Cristóvão, J.; Almeida, N. J.; Anastácio, R.; Oosterbeek, L., 2017. Where do we go now? Primeiros passos na construção de um geoportal arqueológico para o Alto Ribatejo. XIII JIAP – Jornadas Iberoamericanas de Arqueologia e Património em Portugal. Museu de Arte Pré-Histórica de Mação, 27-28 March, 2017. Org. MAP, ITM, CMM, CGeo.

6. Almeida, N. J.; Saladié, P.; Cerrillo Cuenca, E.; Oosterbeek, L., 2017. Understanding Neolithic leporid accumulations: the examples of Cadaval and Nossa Senhora das Lapas caves (Tomar, Middle Tagus, Portugal). EZI2017. Universidade do Algarve, Faro, 26-29 April, 2017.

Events

1. International Seminar *Education, training and communication in the cultural management of landscapes*. APHELEIA - Cultural Integrated Landscape Management for Sustainable Development and Global Understanding. Mação, 29th March to 8th April, 2017.

2. XIII JIAP, *Jornadas Iberoamericanas de Arqueologia e Património em Portugal*. Mação, 27th and 28th March, 2017. Painél de Arqueologia e Património.

Strategies of territory occupation during the Holocene in the Middle Tagus (Es.Ter.Tejo)

Davide Delfino[1], Luiz Oosterbeek[1, 2] and Nelson J. Almeida[1, 2]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; Earth and Memory Institute, Largo Infante D. Henrique, 6120-750 Mação, Portugal; davdelfino@gmail.com

(2) Polytechnic Institute of Tomar, Estrada da Serra, Campus da Quinta do Contador, 2300-313 Tomar, Portugal; loost@ipt.pt; nelsonjalmeida@gmail.com

Project type: Research and Innovation

Leader: Davide Delfino

Coordination: Davide Delfino, Luiz Oosterbeek and Nelson J. Almeida

Team: Davide Delfino, Luís Oosterbeek, Nelson Almeida, Cris Scarre, Sara Garcês, Cristiana Ferreira, Vera Moleiro, Fernando Coimbra, George Nash, Hipólito Collado, Sara Cura, Pierluigi Rosina, Hugo Gomes, Gustavo Portocarrero, Pedro Cura, Rita Anastácio, João Baptista, Henrique Cerrillo Cuenca, Lidia Catarino, Mário Quinta Ferreira, Nuno Queiroz, Jorge Cristovão, Vitor catarino, António Ventura, Anabela Borralheiro, Dragos Gheorghiu and Filomena Gaspar

Instituitions involved: Geosciences Center of the University of Coimbra, Instituto Terra e Memória, Centro de Investigação de Antropologia e Saúde da Universidade de Coimbra, Câmara Municipal de Mação, Câmara Municipal de Abrantes, Direção Geral do Património Cultural

Goals: Characterize the strategic choices in the occupation and management of the territory of the Middle Tagus Holocene, with a special focus on transitional chrono-cultural periods between the Early Mesolithic and the Iron Age.

Results:

- Together with FCT funded project MTAS (PTDC/EPH-ARQ/4356/2014), several campaigns of fieldwork were carried out in the Middle Tagus region, namely archaeological excavations (Anta 1 de Vale da Laje and Salvador in Tomar) and field surveys (Abrantes, Constância, Mação, Tomar).

- Participation in the Annual Meeting of Istituto Italiano di Preistoria e Protostoria, Museo Nazionale Etnografico e Archeologico "L. Pigorini", 27th january.

- Participation in the VI International Journeys of Museu Ibérico de Arqueologia e Arte (M.I.A.A.), Abrantes, 18th May

- Submission and publication of articles, book chapters and books.

- Participation in the organization of events: 2017 –International Colloquium "FortMetalAges. Late Prehistoric

Fortifications in Europe: Defensive, symbolic and territorial aspects from the Chalcolithic to the Iron Age", Guimarães 10th-12th November. Org. Scientific Commission "Metal Ages in Europe" of I.U.S.P.P./U.I.S.P.P. and Martins Sarmento Society.

Outputs:

Books

1. Delfino, D.; Oosterbeek, L.; Garcês, S. (eds.), 2017. *Há 70 anos: o Castelo Velho do Caratão: Descoberta, Investigações e Novas Perspectivas para a Compreensão do Passado, que e o Nosso Património Comum*, Akeos, 41, Mação: Instituto Terra e Memória, ISSN 873-593-X.

2. Portocarrero, G.; Delfino, D.; Gaspar, F., eds., *História do castelo de Abrantes*. Abrantes: Câmara Municipal de Abrantes (*in press*).

Book chapters

1. Delfino, D., 2017. A primeira Abrantes no morro do Castelo. In Portocarrero, G., Delfino, D., Gaspar, F. (eds.), *História do castelo de Abrantes*. Abrantes: Câmara Municipal de Abrantes (*in press*).

Articles

1. Delfino, D.; Cura, P., 2017. O sítio amuralhado de altura do Castelo Velho da Zimbreira (Envendos-Mação). Cinco anos de investigação num lugar estratégico. In Delfino, D., Oosterbeek, L., Garcês, S., eds., *Há 70 anos: o Castelo Velho do Caratão: Descoberta, Investigacões e Novas Perspectivas para a Compreensão do Passado, que é o Nosso Património Comum*. Arkeos, 41. Mação: Instituto Terra e Memória, pp. 65-76 ISSN 873-593-X

Communications

1. Delfino, D.; Portocarrero, G.; Gaspar, F., 2017. *Progetto Cast.Ab. 2013-2016: il Castelo-Fortaleza de Abrantes (Portogallo) e le sue origini protostoriche in un progetto di scavo urbano*. II Incontro Annuale di Preistoria e Protostoria "Le etá del Bronzo e del Ferro in Italia: contesti protostorici in area urbana", Roma- Museo Nazionale Preistorico Etnografico "Luigi Pigorini", 27th january 2017. Org. Istituto Italiano di Preistoria e Protostoria.

2. Delfino, D., 2017. *O Médio Tejo no contacto com os Fenícios: novos dados desde da escavação do Castelo de Abrantes e novas oportunidades de investigação e museologia*, VI Jornada Internacional do M.I.A.A., Abrantes, 18th May 2017. Org. Câmara Municipal de Abrantes.

Environmental and human dynamics during Holocene, in Tagus Valley (SFRH/BD/78542/2011)

Cristiana Ferreira[1]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal. Earth and Memory Institute, Largo Infante D. Henrique, 6120-750 Mação, Portugal; ferreira.cris.00@gmail.com

Project type: PhD in Quaternary, Materials and Cultures, University of Trás-os-Montes e Alto Douro (Portugal)

Leader: Cristiana Ferreira

Coordination: Pierluigi Rosina, Francesc Burjachs and Luiz Oosterbeek

Team: Cristiana Ferreira, Pierluigi Rosina, Francesc Burjachs and Luiz Oosterbeek

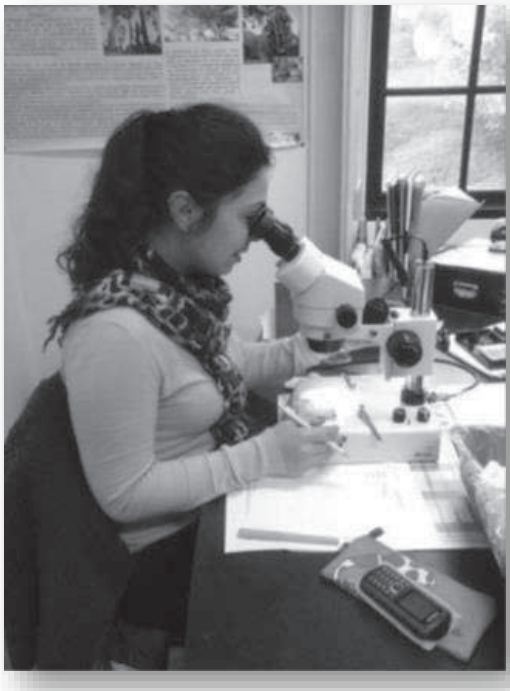
Instituitions involved: University of Trás-os-Montes e Alto Douro, Geosciences Center of the University of Coimbra, Institut Català de Paleoecologia Humana i Evoluciò Social, Junta da Extremadura, Museu de Arte Pré-Histórica e do Sagrado no Vale do Tejo, Vrije University Amsterdam

Goals: Finished in 2017, this PhD project was financed by FCT through an Individual Doctorate Scholarship. This thesis objective is to contribute to the understanding of the transition to agro-pastoralist societies and posterior development of this economic system. Based on vegetation development records from the Tagus Valley we try to relate these changes with Holocene palaeoenvironmental dynamics. Palynology was the main analytical procedure aiming to acquire data on the vegetation composition in order to access which factors influenced its evolution during this period.

Results:

- Pollen and non-pollen-palynomorphs analysis allowed relating pastoral activities with Tagus Valley communities preceding the first direct indicators of agricultural practices.
- First evidences of agriculture were registered at ca. 7.000 ca BP by the presence of cereal in pollen spectra.
- Although relevant indicators of agriculture and pastoral practices are observable since the Mesolithic/Early Neolithic.
- Vegetation record and fire events occurrence only indicate an anthropic impact in the landscape after 5.000 cal BP.
- The intensification of agro-pastoral practices is notorious during the Chalcolithic and Bronze Age.
- In order to continue the research line of archaeobotany inserted in the Quaternary and Prehistory Group – Geosciences Centre, it is intended to develop the Laboratory of Archaeobotany and Ecology

(LAEM), which will be based in Mação.



Observation and counting sedimentary charcoals to identify paleo-fire events in the Lower Tagus Valley.

Outputs:

Thesis

1. Ferreira, C., 2017. *Dinâmicas Ambientais e Humanas durante o Holocénico, no Vale do Tejo*. PhD in Quaternary, Materials and Cultures. UTAD, Vila Real. 270 p.

Proceedings

1. Almeida, N. J.; Ferreira, C.; Garcês, S.; Cruz, A.; Rosina, P.; Oosterbeek, L., 2017. The Western network revisited: the transition into agro-pastoralism in the Alto Ribatejo, Portugal. In Besse, M., Guilaine, J., *Materials, production, exchange network and their impact on the societies of Neolithic Europe. Proceedings of the XVII UISPP World Congress (1-7 September 2014, Burgos, Spain)*. Volume 13/Session A25a. Oxford: Archaeopress Archaeology, 39-49.

Zooarchaeology and Taphonomy of the transition to agro-pastoralism in the Lower and Middle Tagus valley (SFRH/BD/78079/2011)

Nelson J. Almeida[1]

(1) Polytechnic Institute of Tomar, Estrada da Serra, Campus da Quinta do Contador, 2300-313 Tomar, Portugal. Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal. Earth and Memory Institute, Largo infant D. Henrique, 6120-750 Mação, Portugal; nelsonjalmeida@gmail.com

Project type: PhD University of Trás-os-Montes e Alto Douro

Leader: Nelson J. Almeida

Coordination: Luiz Oosterbeek, Palmira Saladié Balleste and Enrique Cerrillo Cuenca

Team: Nelson J. Almeida, Luiz Oosterbeek, Palmira Saladié Balleste and Enrique Cerrillo Cuenca

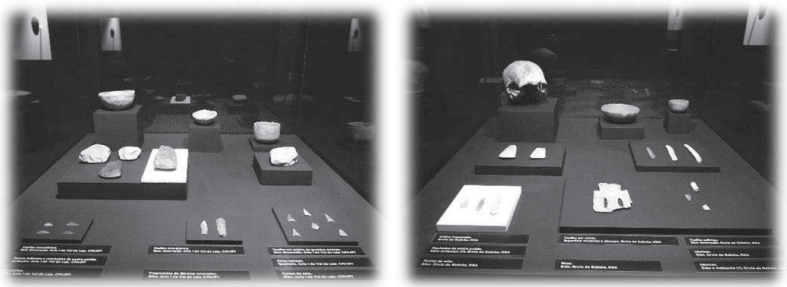
Instituitions involved: University of Trás-os-Montes e Alto Douro, Geosciences Center of the University of Coimbra, Centro Transdisciplinar das Arqueologias, Instituto de Arqueología de Mérida, Institut Català de Paleoecologia Humana i Evoluciò Social, Junta da Extremadura, Museu de Arte Pré-Histórica e do Sagrado no Vale do Tejo, Museu Nacional de Arqueologia, Museu da Cidade de Lisboa/Centro de Arqueologia de Lisboa, Museu Municipal da Amadora, Museu dos Serviços Geológicos, Museo Arqueológico de Badajoz, Museo de Cáceres

Goals: Finished in 2017, this PhD project was financed by FCT through an Individual Doctorate Scholarship. It focused on three main problematics: i) historical, concerning the applicability of archaeofaunistical studies as a means to better understand and discuss the neolithization process and development (Mesolithic to Final Neolithic/ Chalcolithic) in the Lower and Middle Tagus valley; ii) methodological, dealing with the conceptual basis of using actualistic data and experimental archaeology in taphonomy studies; iii) scientific knowledge socialization, focusing the Lower Tagus neolithization by means of a temporary (and itinerant) exhibit.

Results:

- Production of a state of the art for Southwestern Iberia Mesolithic/ Neolithic (e.g., genetics, palaeoenvironment, archaeography, chronology, palaeoeconomy).
- Acquisition of biometric data (*Bos*, *Sus*, *Ovis*, *Capra*) and discussion of results in terms of domestication and size changes.
- Update and synthesis of neolithic zooarchaeological data.
- Implementation of taphonomy methodologies for a better

understanding of the formation of studied archaeological contexts.
- Discussion of small prey (leporids) accumulation and modification during the Neolithic in Central Portugal.
- Realization of the "Symbols and Technology on the Daw of Agro-Pastoralism in the Alto Ribatejo" temporary exhibit in the National Museum of Archaeology of Lisbon, and preparation of an itinerant exhibit.
- Participation in several scientific (and other) meetings with oral and poster communications.



Details of the exhibition "Symbols and Technology on the Dawn of Agro-Pastoralism in the Alto Ribatejo" at the National Museum of Archaeology, Lisbon.

Outputs:

Books

1. Encarnação, G.; Almeida, N. J., 2017. *O povoado da Espargueira / Serra das Éguas. Trabalhos arqueológicos realizados entre 2003 e 2008*. Relatórios 10. Associação de Arqueologia da Amadora, Câmara Municipal da Amadora. 65 p.

Thesis

1. Almeida, N. J., 2017. *Zooarqueologia e Tafonomia da transição para a agro-pastorícia no Baixo e Médio Vale do Tejo*. PhD in Quaternary, Materials and Cultures, UTAD, Vila Real. 624 p.

Proceedings

1. Almeida, N. J.; Ferreira, C.; Garcês, S.; Cruz, A.; Rosina, P.; Oosterbeek, L., 2017. The Western network revisited: the transition into agro-pastoralism in the Alto Ribatejo, Portugal. In Besse, M., Guilaine, J., *Materials, production, exchange network and their impact on the societies of Neolithic Europe. Proceedings of the XVII UISPP World Congress (1-7 September 2014, Burgos, Spain)*. Volume 13/Session A25a. Oxford: Archaeopress Archaeology, 39-49.

Cervids: symbols and society in Early Agriculture in Tagus Valley

Sara Garcês[1]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; saragarces.rockart@gmail.com

Project type: Research; Ph.D.

Leader: Sara Garcês

Coordination: Luiz Oosterbeek and Hipólito Collado Giraldo

Team: Sara Garcês, Luiz Oosterbeek and Hipólito Collado Giraldo

Instituitions involved: Geosciences Center of the University of Coimbra, UTAD – University of Trás-os-Montes e Alto Douro

Goals: The present thesis aims to point out the Tagus Valley Rock Art Complex (CARVT) in a systematic and updated way. It has 12 Rock Art nucleuses along 120 km length between the Ocreza River mouth (downstream) and the Erges River valley (upstream). These nucleuses hold a set of 1636 engraved rocks with 6988 figures of several typologies that cover a timeline roughly from the Upper Palaeolithic to the Final Bronze Age.

The work includes an approach of the story of the investigation of the CARVT, the context of the problematic and of the region, the analytical description of the rock engravings and the systematisation of the subjects, with a specially analyse of the deer as the central figure of the CARVT.

The study is guided by two main questions; a primary one: what can one understand about the occupation of the territory and the timeline of the Tagus Valley Rock Art Complex, and a methodological one: from a qualitative point of view, how different can a more exhausting study be towards other studies focused on places or rocks apparently more complex and on mainly anthropological arguments or with resort to essentially supra regional contextualisation?; The conclusions answer the two questions and are complemented by the bibliography and a catalogue of the studied places.

Results:

Complete catalog of Tagus Rock Art Valley figure assemblage; Intensive study on the deer figure, intrinsically connected with the archaeological contexts in regional and national territory and the complete chronological frame of Tagus Rock Art Valley.

Outputs:

Books

1. Garcês, S.; García Arranz, J. J.; Collado Giraldo, H.; Rosina, P.; Oosterbeek, L., (Coord.), 2017. Las Manifestaciones gráficas rupestres en el Dolmen de Soto (Trigueros, Huelva).

2. Delfino, D.; Oosterbeek, L.; Garcês, S., (Eds.), 2017. Há 70 anos: O Castelo Velho do Caratão: Descoberta, Investigações e Novas Perspectivas para a Compreensão do Passado, que é o Nosso Património Comum, Arkeos, 41, 107p.

3. Garcês, S.; Gomes, H.; Martins, A.; Oosterbeek, L., (Eds.), 2017. IV ASP: A Arte das Sociedades Pré-Históricas. Actas do IV Congresso de Doutorandos e Pós-Doutorandos, 26-29 de Novembro de 2015, Mação, Portugal, Techne 3(1), 143p.

4. Garcês, S.; Collado, H.; Arranz, J. J.; Oosterbek, L., (Eds.), 2017. XIX International Rock Art Conference, IFRAO 2015. Cáceres (Spain), 31 August-4 September.Techne 3(1), 63p.

Articles

1. Nash, G.; Garcês, S., 2017. The relevance of watery soundscapes in a ritual context. Time & Mind, 10(1): 69-80.

Communications

1. 2017, Congresso da Associação dos Arqueólogos Portugueses: "Uma abordagem "multi-proxy" aplicada à conservação do sítio de arte rupestre de Cobragança, Mação, Portugal".

2. 2017, Trigueros, Huelva, Espanha: "Metodología realizada en la documentación del arte rupestre del dolmen de soto y de la extracción de muestras y resultado de las analíticas de los pigmentos".

3. 2017, Jornadas Ibero-Americanas de Arqueologia e Património, Mação: "Caracterização Arqueométrica da Arte Rupestre Esquemática pintada na província de Badajoz, Espanha".

National Congresses Proccedings

1. Oosterbeek, L.; Pereira, A.; Delfino, D.; Inácio, E.; Mourão, H.; Nicoli, M.; Rodrigues, M. H.; Almeida, N.; Rosina, P.; Anastácio, R., Cura, P., Cura, S., Garcês, S. (2017) Para além da Gestão Patrimonial: uma nova relação da Arqueologia como o território. *Actas do II Congresso da Associação dos Arqueólogos Portugueses,* Lisboa, 22 a 26 de novembro de 2017.

2. Garcês, S.; Gomes, H.; Moleiro, V.; Pires, H.; Joaquim, F.; Pereira, A.; Oosterbeek., L., 2017. Uma abordagem "multi-proxy" aplicada à conservação do sítio de arte rupestre de Cobragança, Mação, Portugal. *Actas do II Congresso da Associação dos Arqueólogos Portugueses,* Lisboa, 22 a 26 de novembro de 2017.

3. Collado, H.; Gomes, H.; Rosina, P.; Garcês, S., 2017. Archaeometric characterization of painted schematic rock art in the province of Badajoz, Spain. *Techne* 3(1): 125-137.

Popular magazines:

1. Nash, G.; Garcês, S., 2017. Secrets of the dolmens. Discovering lost masterpieces by ancient artists in the Iberian Peninsula. *Current World Archaeology.* February/March 2017 Issue 82: 34-36.

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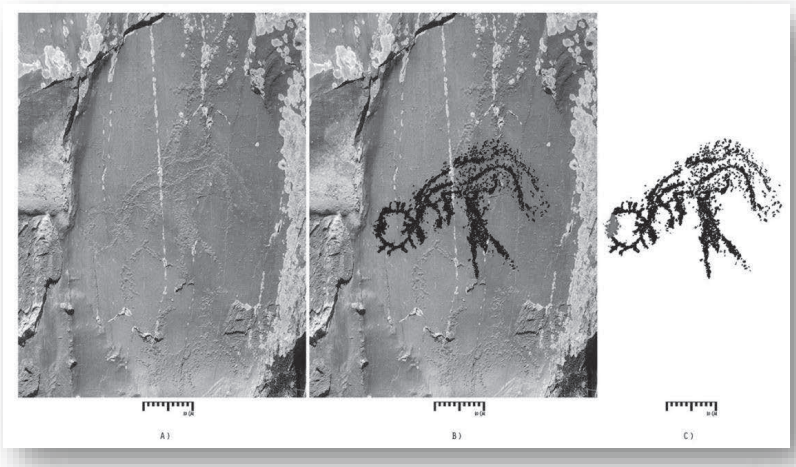


Detail of rock 158 from São Simão.

Neolithic pottery characterization from two regions of the Iberian hinterland

Darko Stojanovski[1]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal.

Project type: PhD research (22 March 2017, UTAD, Vila Real, Portugal)

Leader: Darko Stojanovski

Coordination: Luiz Oosterbeek (IPT and ITM, Portugal), Marta Arzarello (UNIFE, Italy) and Laurens Thissen (TACB, Netherlands)

Team: Darko Stojanovski, Luiz Oosterbeek, Marta Arzarello and Laurens Thissen

Instituitions involved: UTAD (Vila Real, Portugal), UNIFE (Ferrara, Italy), OGU - University of Bristol (Bristol, UK), IPT (Tomar, Portugal), ITM (Maçao, Portugal)

Goals: (Re)evaluation of the complete pottery assemblages from two Portuguese (Anta 1 da Val de Laje and Grute do Cadaval) and one Spanish site (Cueva de los Postes), all pertaining to the Iberian Neo/Chalcolithic. This includes basic typological and technological assessment which, aided by a series of newly obtained 14C AMS dates, served as a base for stratigraphic and historical interpretation of the beginnings and the development of the Neolithic in SW Iberia. The later phase of the project focused on the socio-economical aspects of pottery, through sampling, extraction of organic residue, GC analyses and isotopic measurements.

Results: The typology confirmed a previously proposed theory, representing the Neo/Chalcolithic of SW Iberia as a very complex transitional, more a process than a period. This process involves the interaction of at least two culturally distinct groups. The absolute dating method confirmed the presence of pottery among human groups in the interior of the peninsula (Cueva de los Postes) at the end of the 6th millennium calBC. The isotopic analysis of the lipids extracted from the pottery confirmed several points: a) despite the acidity of the soil in the area of megalithic structures, which prevents the preservation of organic material in the layers and makes the chronological evaluation extremely difficult, lipid molecules are surprisingly well preserved inside the pottery matrix; this provides potential for direct dating of the lipid molecules and with that direct dating of the pottery, a methodology which is still in a development phase; b) the isotopic measurements of the extracted lipids, except for the wild and domestic animals meat, confirmed also the presence of dairy products; this implies that milk and milk products were

widely consumed since the beginning of the Neolithic in this part of Europe, which speaks of a very developed phase of agriculture and human – animal relations; c) a significant offset in the isotopic measurements from the referent values opens several lines of debate, implying either environmental constraints during the Neo/Chalcolithic in SW Iberia, or more probable, a seasonal cycle of movement of people and animal herds (horizontal transhumant pastoralism), a cycle which included pasture in saline environment (Tagus estuary).

Outputs:

- Neolithic pottery characterization from two regions in the Iberian hinterland (PhD thesis, unpublished).

- Anta 1 da Val de Laje – ancient pottery lipid analyses from the "megalithic world" of the Portuguese interior (paper, in preparation).

- New evidence for the Early Neolithic of the Iberian interior – absolute dates and stratigraphy of Cueva de Los Postes (paper, in preparation).

Application of predictive models in the research of the Lower Tagus Neolithic settlement patterns evolution

Luís André Costa[1]

(1) Faculty of Arts of the University of Porto, Via Panorâmica, 4150-564 Porto, Portugal; Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; luiscostapac@gmail.com

Project type: MSc Faculty of Arts of the University of Porto

Leader: Luís André Costa

Coordination: Patrícia Abrantes and Nelson J. Almeida

Team: Luís André Costa, Patrícia Abrantes and Nelson J. Almeida

Institutions involved: Faculty of Arts of University of Porto, Geosciences Center of the University of Coimbra and Earth and Memory Institute

Goals: The development of research projects by several teams, specially the ongoing MTAS project financed by FCT, raises questions regarding evidences dispersal of Mesolithic and Neolithic open-air sites. The goal of this MSc dissertation is the construction of a predictive model that might serve as a tool to support the traditional archaeological field survey and land use planning.

Three different methods will be used to build the GIS model and the results will be compared through logistic regression, multicriteria analysis and neuronal networks. Environmental (temperature, precipitation), geographical (slope, hydrography, altitude) and archaeological (provenience of raw materials) variables will be used.

Due to their characteristics, open-air habitat sites spawning the Mesolithic to Middle Neolithic in the Lower Tagus Basin will be selected as an analytical sample.

Results: Expected results will allow for a better planning of filed surveys in the selected area, this way helping existing projects and future ones.

Results are to be compared with others from other areas in the Iberian Peninsula for which predictive models of Neolithic occupation already exist.

Outputs:

MSc dissertation in progress.

Archaeological inventory of the Municipality of Chamusca

Fernando Augusto Coimbra[1]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; coimbra.rockart@yahoo.com

Project type: Research (Multiannual Archaeology Research Project)

Leaders: Fernando Augusto Coimbra, Silvério Figueiredo and Alexandra Figueiredo

Coordination: Fernando Augusto Coimbra

Team: Fernando Augusto Coimbra, Silvério Figueiredo, Alexandra Figueiredo, Pedro Proença e Cunha, Rita Anastácio, Raquel Lázaro, Ana Graça and Mário Santos

Institutions involved: Centro Português de Geo-História e Pré-História; Municipality of Chamusca

Goals: Inventorying all the archaeological sites and remains from the municipality of Chamusca. Extend the archaeological knowledge of the municipality. Define areas of archaeological potential and indicate typological and chronological proposals for the identified sites, assisting in their interpretation. Dissemination and validation of knowledge in terms of Heritage Education, aiming the public understanding of archaeology.

Results:

Participation, as keynote speaker, in the Round Table "Archaeology of Chamusca", 2017.

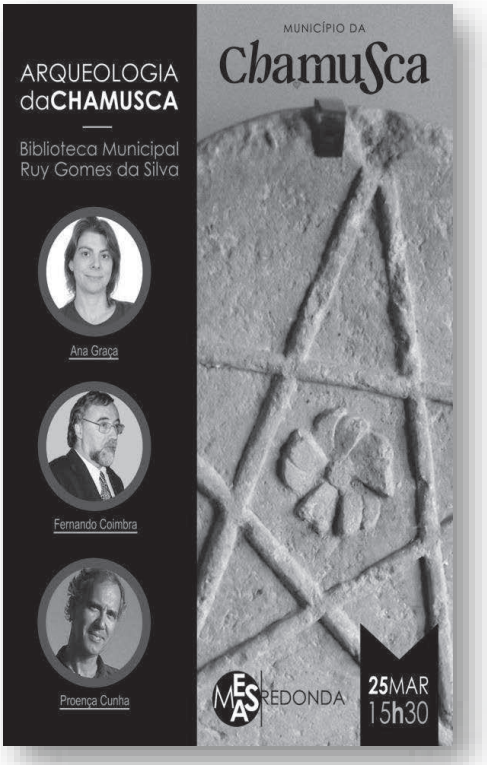
Participation in the IV Journeys of Archaeology of the Tagus Valley, Chamusca, 2017.

Submission and publication of articles, book chapters and one book.

Participation in the organization of events:

2017 – Organization of the Round Table "Archaeology of Chamusca".

2017 – Member of the Organizing Committee and of the Scientific Committee of IV Journeys of Archaeology of the Tagus Valley, Chamusca.



Poster of the Round Table «Archaeology of Chamusca», with the keynote speakers.

Outputs:

Books

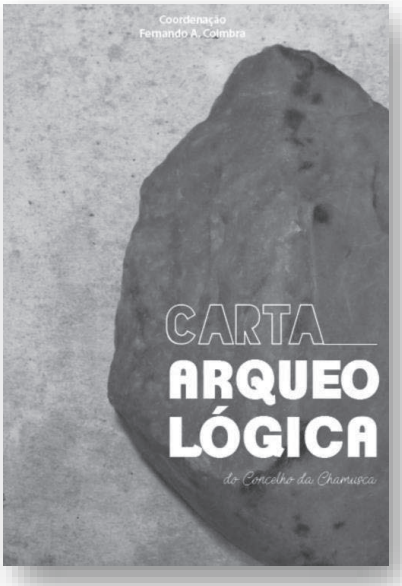
1. Coimbra. F. A. (ed.). Carta Arqueológica do Concelho da Chamusca. Do Paleolítico à Idade Moderna. Câmara Municipal da Chamusca. 162 p. (*in press*).

Book chapters

1. Coimbra. F. A. Introdução: Objetivos e relevância do estudo. In: "Carta Arqueológica do Concelho da Chamusca. Do Paleolítico à Idade Moderna". Câmara Municipal da Chamusca (*in press*).

2. Coimbra. F. A. Caracterização arqueológica: Idade do Bronze e Idade do Ferro. In: "Carta Arqueológica do Concelho da Chamusca. Do Paleolítico à Idade Moderna". Câmara Municipal da Chamusca (*in press*).

Broad domain of the landscape and the Tagus river view from the Protohistoric settlement of Senhor do Bonfim, Chamusca (from Coimbra, in press).



Front cover of Carta Arqueológica do Concelho da Chamusca. Do Paleolítico à Idade Moderna (from Coimbra, ed.; in press).

Articles

1. Coimbra, F. A.; Lázaro, R.; Anastácio, R., 2017. A Carta Arqueológica da Chamusca: dados preliminares, *Açafa online,* 11, 8 p.

Communications

1. Coimbra, F. A.; Figueiredo, S.; Figueiredo, A.; Cunha, P. P.; Lázaro, R.; Anastácio, R.; Martins, A. A.; Santos, M.; Sousa, F. Novos dados para a Carta Arqueológica da Chamusca. *Proceedings of IV Journeys of Archaeology of the Tagus Valley* (*in press*).

2. Lázaro, R. Valorização da Chamusca Arqueológica. *Proceedings of IV Journeys of Archaeology of the Tagus Valley* (*in press*).

3. Santos, M. As Freguesias de Ulme e Carregueira: da pré-história à atualidade. *Proceedings of IV Journeys of Archaeology of the Tagus Valley* (*in press*).

Schist plaque from Vale de Cavalos, Chamusca
(from Coimbra, ed.; in press).

Project CARACA (Caldas Rainha, 2017-2020)

Alexandra Figueiredo[1]

(1) Polytechnic Institute Tomar, Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; alexfiga@ipt.pt

Project type: National Archaeological Project

Leader: Alexandra Figueiredo

Coordination: Alexandra Figueiredo, Adolfo Silveira, Claudio Monteiro

Team: Sónia Simões, Anderson Tognoli and Ricardo Lopes (field technic)

Institutions involved: Polytechnic Institute of Tomar, CAAPortugal, DGPC

Goals:

• Construction of an Archeological Chart with an inventory of recognized and localized archaeological sites;

• Construction of an inventory of terrestrial and underwater data and potential polygons regarding information recorded in documents about possible unidentified archaeological remains or located on the ground.

• Establish a framework and chrono-cultural and typological maps of the occupation of the county of Caldas da Rainha.

• Contribute to the perception of the existing patrimony in the county of Caldas da Rainha.

• Contribute to the education and cultural formation of the municipality for the recognition and appreciation of the Heritage.

Template of the project

Heritage education actions

Heritage education actions

Heritage education actions

Outputs:

Articles

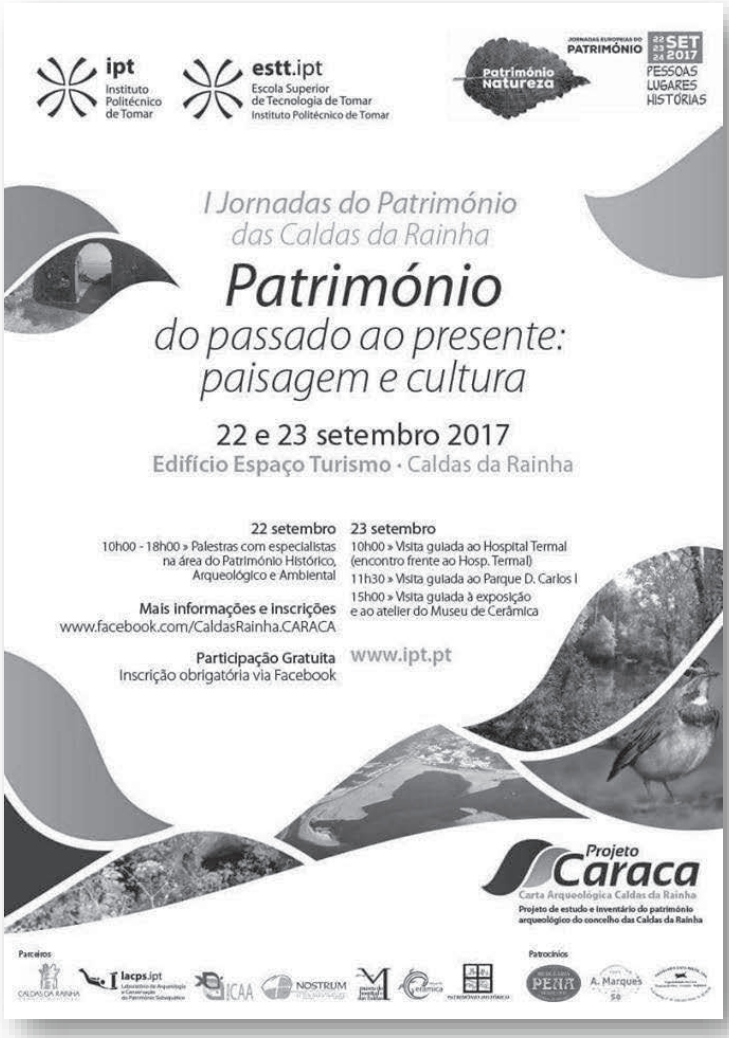
1. Figueiredo, A.; Berezowski, W. (2017) A Educação Patrimonial como via para uma comunidade arqueologicamente mais consciente: O caso do complexo megalítico de Rego da Murta - Portugal. In *Revista TEMPORIS [ação]. Dossiê Prática Arqueológica e Educação Patrimonial* Vol 17. ISSN 2317-5516. 65-87 http://www.revista.ueg.br/index.php/temporisacao/article/view/5842/4661

2. Figueiredo, A.; Lopes, R.; Simões, S.; Monteiro, C.; Silveira, A., 2017. A memória como ferramenta de pesquisa e investigação arqueológica. In *atas Arqueologia em Portugal*, 2017. Estado em questão. Associação dos Arqueólogos Portugueses Lisboa, ISBN: 978-972-9451-71-3. 227-235.

Communications

1. Figueiredo, A.; Lopes R.; Simões, S.; Monteiro, C; Silveira, A., 2017. A Memória como Ferramenta de Pesquisa e Investigação Arqueológica, 25 de Novembro de 2017, II Congresso da Associação dos Arqueólogos Portugueses, 22 a 26 de Novembro de 2017.

2. Figueiredo, A.; Lopes R.; Simões, S.; Monteiro, C; Silveira, A., 2017. *A Memória como Ferramenta de Pesquisa e Investigação Arqueológica,* , in I Jornadas do Património das Caldas da Rainha" Património do passado ao presente: paisagem e cultura" 22 e 23 Setembro de 2017.



Web-resources

https://www.facebook.com/LabACPS/

https://www.facebook.com/CaldasRainha.CARACA/

Project MEDICE (Alvaiázere, 2016-2020)

Alexandra Figueiredo[1]

(1) Polytechnic Institute Tomar, Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; alexfiga@ipt.pt

Project type: National Archaeological Project

Leader: Alexandra Figueiredo

Coordination: Alexandra Figueiredo, Cláudio Monteiro.

Team: Anderson Tognoli, Alexandre Peixe, Daivisson Santos, Keyla Frazão, Ricardo Lopes, Adolfo Silveira, Deisi Farias, Fernando Augusto Coimbra, Liliana Carvalho, Silvério Figueiredo.

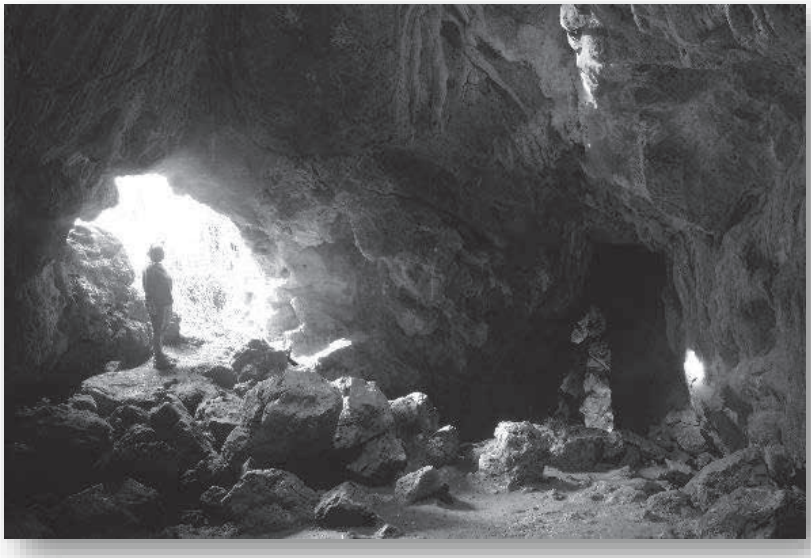
Institutions involved: Polytechnic Institute of Tomar, Geosciences Centre, CAAPortugal, Lisbon Autonoma University

Goals: Establish a chronostratigraphic picture of the cultural phenomena related to the contexts of prehistoric occupation to the classical period, giving a certain highlight to the symbolic and cultual records occurring in this region.

Recognize previous contexts of food producing societies with special emphasis on the transition phases, including the mechanisms of survival and economic and social relationship between the different groups and the elements that characterize them.

Recognize contexts related to the beginning of societies that register metallurgical exploitation in their behavior, including the mechanisms of survival and economic and social relationship between the different groups and the elements that characterize them, perceiving how they relate to the antecedent societies and protagonize future actions.

Results: Archaeological works in diferent sites from pre-history to classical period.



Cave Algar da Água, one of the sites in work.

Outputs:

Articles

1. Figueiredo, A. (2017). Cenários, dinâmicas e rituais na pré-história recente na região do Nabão. In *Cadernos de Estudos Leirienses*. Vol. 13. Setembro 2017. Texinverso. ISSN 2183-4350.

2. Figueiredo, A.; Berezowski, W. (2017) A Educação Patrimonial como via para uma comunidade arqueologicamente mais consciente: O caso do complexo megalítico de Rego da Murta - Portugal. In *Revista TEMPORIs[ação]. Dossiê Prática Arqueológica e Educação Patrimonial* Vol 17. ISSN 2317-5516. 65-87 http://www.revista.ueg.br/index.php/temporisacao/article/view/5842/4661

3. Figueiredo, A.; Coimbra, F.; Monteiro, C.; Ribeiro, N. (2017) Preliminary Analysis of the rock art from Buracas da Serra, Alvaiázere (Portugal). In Revista Cuadernos de Arte Prehistórico ISSN 0719-7012 – nº 4 – julio/diciembre.

Web-resources

https://www.facebook.com/LabACPS/

Guarani Archeology in the State of Rio Grande do Sul, Brazil

André Luis Ramos Soares[1, 2] and Sergio Celio Klamt[3]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; alrsoaressan@gmail.com;

(2) Federal University of Santa Maria. Av. Roraima, 1000, Bairro Camobi, 97.105-900 Santa Maria, Rio Grande do Sul, Brasil.

(3) University of Santa Cruz do Sul, R. Jesus Gil, 2293, Bairro Universitário, 96815-900, Santa Cruz do Sul, Rio Grande do Sul, Brasil; sergiocelioklamt@gmail.com

Project type: Research and Innovation

Leader: André Luis Ramos Soares and Sergio Celio Klamt

Coordination: André Luis Ramos Soares and Sergio Celio Klamt

Team: André Luis Ramos Soares (Federal University of Santa Maria, Brazil), Sergio Celio Klamt (University of Santa Cruz do Sul, Brazil), Pierluigi Rosina (Polytechnic Institute of Tomar, Portugal), Jedson Cerezer (Espaço Arqueologia Licenciamento Cultural), Luana da Silva de Souza (University of Santa Maria, Brazil), Murilo de Melo Penha (University of Santa Maria, Brazil)

Institutions involved: Federal University of Santa Maria (Brazil), University of Santa Cruz do Sul (Brazil), Polytechnic Institute of Tomar (Portugal), Espaço Arqueologia Licenciamento Cultural

Goals: Survey, record and academic research about the Guarani archaeological culture. Development of projects of educational action in archaeological patrimony, especially the horticultural Guaranis. Research in experimental archeology of the prehistoric peoples of the State of Rio Grande do Sul. Socialization of academic knowledge in formal and informal spaces of education.

Results:

Participation in the VII meeting of archaeological discussions of the Argentine northeast - EDAN, city of Diamante, province of Entre Ríos, Argentina.

Participation in the 1º Memory and Heritage Journey of NEP-LEPA, UFSM, Santa Maria, RS, Brazil.

Participation in the Congress of Teaching, Research and Extension in History - CONEPEH, UFSM, Santa Maria, RS, Brazil.

Participation in the 32º Integrated Academic Journey - JAI, UFSM, Santa Maria, RS, Brazil.

Participation in the Meeting APHLEIA Cultural Landscape Management for

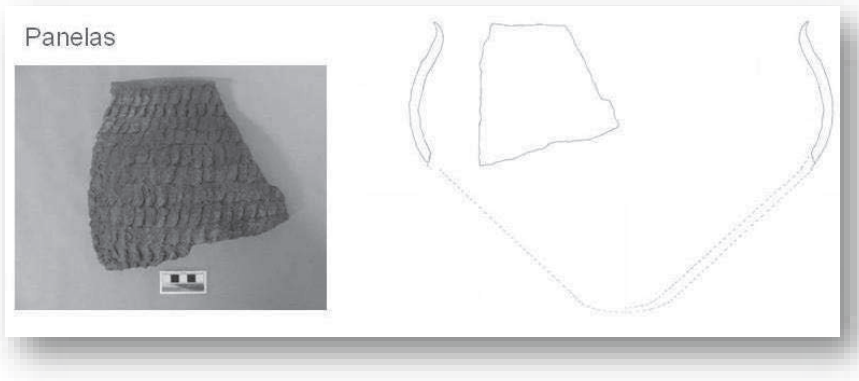
Local and global sustainability, março de 2017, Mação, Portugal.

Participation in the Ibero-American Journey on Archeology, March 2017, Mação, Portugal.

Outputs:

Communications

1. Penha, M. M.; Soares, A. L. R., 2017. The reconstruction of ceramic forms of the RS-TQ-141 Archaeological Site, Cruzeiro do Sul, Rio Grande do Sul, Brazil. Abstract Book, VII meeting of archaeological discussions of the Argentine northeast - EDAN, Diamante, Argentina. pp. 55.



Graphic reconstruction of Guaranis vessels from the RS-TQ-141 Archaeological Site, Cruzeiro do Sul, Rio Grande do Sul, Brazil (from Penha & Soares, 2017).

Technology and symbolism in the Guarani expansion in Southern Brazil

Jedson Francisco Cerezer[1]

(1) Universidade de Trás-os Montes e Alto Douro, Instituto Terra e Memória de Mação/Centre of Geosciences of Coimbra, Lg. Infante D. Henrique 6120-750 Mação, Portugal.

Project type: PhD research undertaken with the finantial support of the Portuguese Foundation for Science and Technology (contract FRH/BD/74394 /2010)

Leader: Jedson Francisco Cerezer

Coordination: Luiz Oosterbeek and André L. R. Soares

Team: Jedson Francisco Cerezer, Luiz Oosterbeek and André L. R. Soares

Institutions involved: University of Trás-os Montes e Alto Douro, Instituto Terra e Memória, Câmara Municipal de Mação (CMM), Centro de Interpretação de Arqueologia do Alto Ribatejo (CIAAR), Centro de Memória do Oeste de Santa Catarina (CEOM), Centro de Pré-história do Alto Ribatejo (CEIPHAR), Centro de Estudos e Pesquisas Arqueológicas (CEPA-UFPR), Centro de Estudos e Pesquisas Arqueológicas (CEPA-UNISC), Fundação Nacional do Índio (FUNAI), Iniversità degli Studi di Trento, Instituto Bioatlântica (IBIO), Instituto Politécnico de Tomar (IPT), Museu Comunitário Almiro Theobaldo Müller (Museu de Itapiranga), Museu Municipal Pastor Karl Ramminger (Museu de Mondaí), Museu do Homem do Sambaqui "Pe. João Alfredo Rohr, SJ" (Colégio Catarinense), Museu do Colégio Mauá – Santa Cruz do Sul, Museu Vicente Palotti – Santa Maria, Núcleo de Estudos Negros (NEN), Universidade do Extremo Sul Catarinense (UNESC) and Federal University of Santa Maria (UFSM)

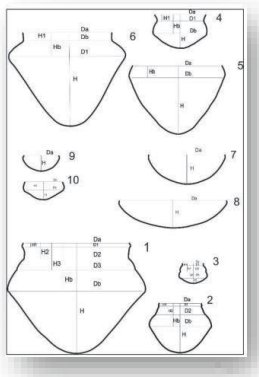
Goals: Tentative models to explain the ceramic artifacts and Guarani territories are presented and discussed in this thesis. From them is built a reflective and argument framework for a new explanation about Guarani expansion. This has at its base the ceramic technology, studies of archaeological experimentation and of morphometry, developed into three macro-regions of southern Brazil (West/high Uruguay, Central Depression of the Rio Grande do Sul and the southern coast of Santa Catarina) including collections of entire recipients and of fragments.

Results

- The combination of morphometric and technological data with the chronologies of archaeological sites and of the territories enabled the presentation of an explanatory model based on the colonization of

territories by waves of long-range advances, resulting from social fission mechanisms.

- Research provided conditions for socializing with Guarani communities the produced knowledge.



Morphologies of Guarani ceramics.

Experimentation project.

Outputs:

Thesis

1. Cerezer, J. F., 2017. Tecnologia e simbolismo na expansão Guarani no Sul do Brasil. Vila Real: Universidade de Trás-os-Montes e Alto Douro.

Prehistoric occupation of Southern Brazil: geoarchaeological context of prehistoric occupation in Upper Uruguay River

Marcos César Pereira Santos[1, 2]

(1) Università degli studi di Ferrara-UNIFE. International Doctorate in Quaternary and Prehistory (IDQP). Sezione di Scienze Preistoriche e Antropologiche

(2) Universidade do Extremo Sul Catarinense-UNESC. Laboratório de Arqueologia Pedro Ignácio Schmitz-LAPIS; marcoscesar@unesc.net

Project type: PhD

Leader: Marcos César Pereira Santos

Coordination: Pierluigi Rosina and Antoine Lourdeau

Team: Marcos César Pereira Santos, Pierluigi Rosina, Antoine Lourdeau, Mirian Carbonera and Juliano Bitencourt Campos

Instituitions involved: Università degli studi di Ferrara-UNIFE, Muséum National d'Histoire Naturelle- MNHN, Univ. Comunitária da Região de Chapecó-UNOCHAPECÓ, Instituto Politécnico de Tomar – IPT, Universidade do Extremo Sul Catarinense- UNESC

Goals: Having a geoarcheological focus, this research aims to define the sedimentary formations sequences' in which we find the archaeological sites of the Volta Grande of the Uruguay River, thus contributing to the chrono-cultural picture of the prehistoric occupation of southern Brazil.

Results:

Participation in the 7º Seminário de Pesquisa em Planejamento e Gestão Territorial. Universidade do Extremo Sul Catarinense. Criciuma, Brasil.

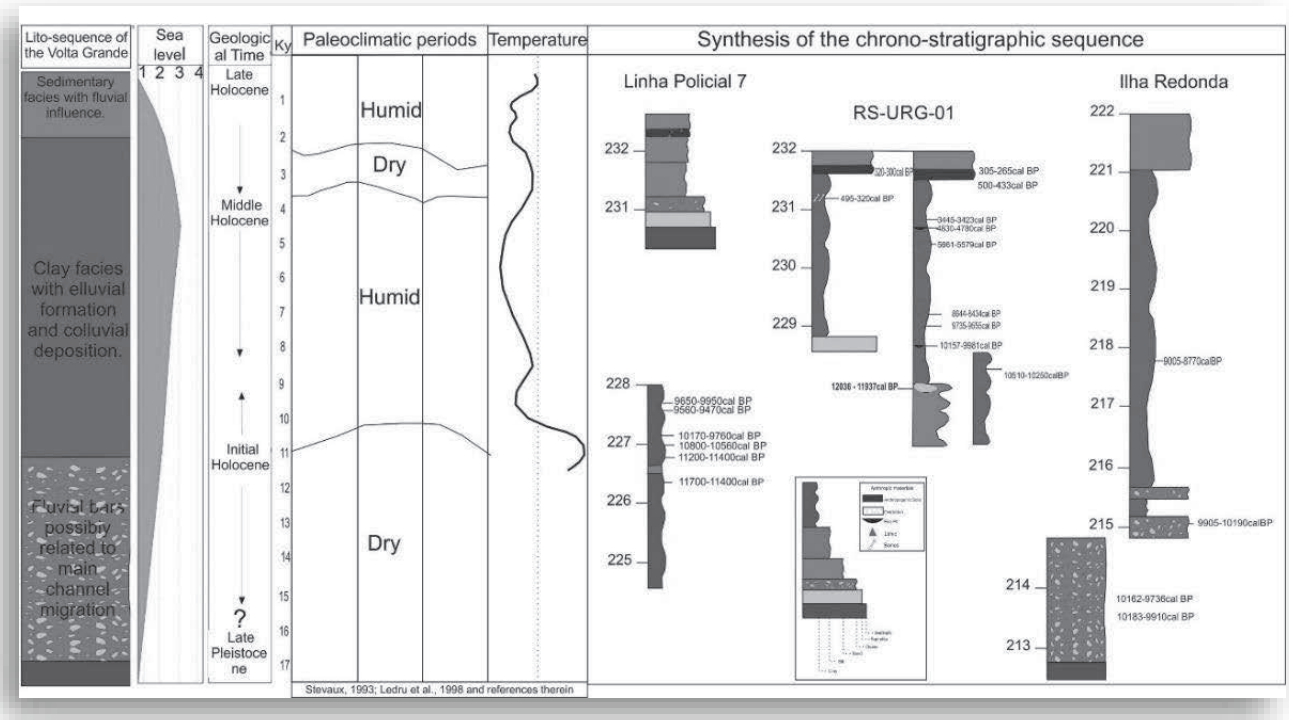
Participation in the XIII Jornadas Iberoamericanas de Arqueologia e Património-Mação, Portugal.

Participation in the XIX Congresso da Sociedade de Arqueologia Brasileira-SAB-Teresina.

Participation in the Terceiro Encontro Acadêmico NZWG-ICAZ - Neotropical Zooarchaeology Working Group-International Council For ArcheoZoology.San José,Uruguay.

Participation in the V Encontro De Geoarqueologia da América Latina-GEGAL. Geoarqueologia em Terras Tropicais. Manizales, Caldas, Colômbia.

Participation in the Journée d'étude Actualités de la recherche en Prehistoire au Brésil, Musée de l'Homme, Paris.



Sedimentary and archaeological chrono-sequence of Prehistoric occupation of the Upper Uruguay River (Brazil; from Santos, 2017).

Outputs:

Book chapters

1. Rodrigues, M. H. S.; Campos, J. B.; Farias, D. S. E.; Deblasis, P.; Santos, M. C. P.; Zocche, J. J., 2017. Gestão Integrada do Patrimônio e da Paisagem Cultural: Breves Considerações. In: Nilzo Ivo Ladwig; Hugo Schwalm. (Org.). Planejamento e gestão territorial: gestão integrada do território. 1ed. Criciúma: Editora Unesc, v. 1, p. 310-321.

Articles

1. Lourdeau A.; Carbonera, M.; Hoeltz, S.; Santos, M.; Lucas, L.; Da Costa, A.; Viana, S., 2017. Debitagem laminar no Sul do Brasil: Habemus núcleos!. *Journal of Lithic Studies*, vol. 4, nr. 2, doi:10.2218/jls.v4i2.xxx (*in press*).

2. Santos, M.; Pavei, D.; Campos, J., 2017. Sambaqui Lagoa dos Freitas, Santa Catarina: estratigrafia, antiguidade, arqueofauna, e cultura material. *Revista Memorare*, ISSN: 2358-0593 (*in press*).

3. Campos, J. B.; Santos, J.; Moser, D.; Ostetto, L. C.; Santos, M. C. P., 2017. Divulgação científica e educação patrimonial em arqueologia: a experiência do I Workshop de Arqueologia da Unesc. *Revista Arqueologia Pública*, v. 11, nº 2, ISSN 2237-8294 (*in press*).

Expanded abstracts published in congress book

1. Votre, G. C.; Noelli, F. S.; Pereira, G. S.; Pavei, D. D.; Zocche, J. J.; Santos, M. C. P.; Campos, J. B., 2017. Arqueologia Entre Rios: Do Urussanga ao Mampituba - Arqueobotânica Guarani. In: VIII Semana de Ciência e Tecnologia, 2017, Criciúma. Anais VIII Semana de Ciência e Tecnologia. Criciúma: EdUnesc, v. 8, p. 1-16.

Communications

1. Santos, M. C. P., 2017. Géoarchéologie dans la haute vallée du fleuve Uruguay, sud du Brésil: reconstitution des séquences sédimentaires de l'Holocène et culture matérielle associée. IIIe Journée d'étude Actualités de la recherche en prehistoire au Brésil, Musée de l'Homme, Paris.

2. Santos, M. C. P.; Rosina, P.; Lourdeau, A.; Carbonera, M.; Campos, J., 2017. Ocupações Pré-Históricas do Sul do Brasil: Contexto Geoarqueológico das Ocupações Pré-Históricas no Alto Rio Uruguai. V Encontro De Geoarqueologia da América Latina-GEGAL. Geoarqueologia em Terras Tropicais. Manizales, Caldas, Colômbia.

3. Lourdeau, A.; Pavei, D. D.; Santos, M. C. P.; Rosina, P.; Carbonera, M.; Costa, A.; Lucas, L. O. E.; Hoeltz, S.; Viana, S.; Campos, J. B., 2017. Ilha Redonda 1 (Foz do Chapecó, SC): uma indústria lítica original no panorama sul-brasileiro. In: XIX Congresso da Sociedade de Arqueologia Brasileira: Arqueologia na trincheira: o papel da Arqueologia no contemporâneo, Teresina, v. 1., p. 86-86.

4. Pavei, D. D.; Borges, C.; Santos, M.C.P.; Campos, J. B., 2017. Quadro arqueofaunístico de um sambaqui do Extremo Sul Catarinense: dados preliminares e tendências de exploração de ecosistemas. In: Terceiro Encontro Acadêmico NZWG-ICAZ - Neotropical Zooarchaeology Working Group - International Council For ArcheoZoology: De océano a océano, múltiples miradas sobre las relaciones entre humanos y animales en los Neotrópicos. San José, Uruguay. Ministerio de Educación y Cultura, p. 34-35.

5. Ribeiro, A. L. M.; Carrer, L. N.; Votre, G. C.; Pereira, G. S.; Pavei, D. D.; Ostetto, L. C.; Zocche, J. J.; Santos, M. C. P.; Campos, J. B., 2017. Arqueologia Pública no Extremo Sul Catarinense: Incentivando os Pequenos A Valorizar e a Preservar seu Patrimônio. In: VIII Semana de Ciência e Tecnologia, 2017, Criciúma. Anais VIII Semana de Ciência e Tecnologia. Criciúma: EdUnesc, v. 8, p. 5-6.

Archaeology and Geosciences: diachronic analysis of raw material management in the prehistoric space of Diamantina, Minas Gerais, Brazil

Ana Carolina Rodrigues Cunha[1]

(1) Universidade de Trás-os Montes e Alto Douro, Instituto Terra e Memória de Mação/Centre of Geosciences of Coimbra, Lg. Infante D. Henrique 6120-750 Mação, Portugal

Project type: PhD research

Leader: Ana Carolina Rodrigues Cunha

Coordination: Andrei Isnardis, Artur Agostinho de Abreu e Sá

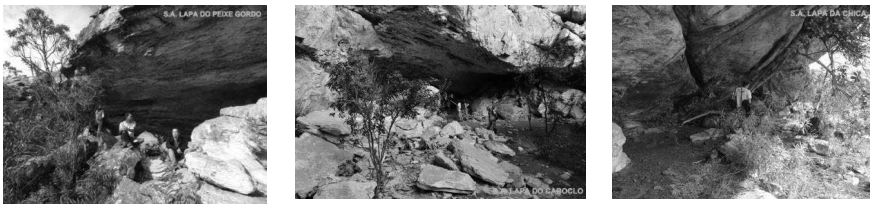
Institutions involved: Universidade de Trás-os Montes e Alto Douro, Universidade Federal de Minas Gerais

Goals: The thesis focused on the study of the prehistoric populations that occupied the region of Diamantina, state of Minas Gerais, Brazil, in chronological horizons established as Old (Pleistocene / Lower Holocene) and Recent (Upper Holocene). Based on horizons of occupations separated by a minimum time gap of 6.000 years, the study proposed to analyze diachronically the management of the lithic material in three archeological sites of this region, regarding its interface with specific elements recognized in the area, in order to advance in the comprehension of the interaction of these diachronic populations with the landscape and their perceptions about raw materials, and to identify potential changes reflected in the lithic industries and their meanings. To this purpose, used a theoreticalmethodological framework derived from lithic technology studies, and from interdisciplinary processes that relate Archaeology and some specialties of Geosciences in two of its main segments: Landscape Archaeology and Geoarchaeology.

Results

- Research findings of the diachronic analysis of the management of the main raw materials, hyaline quartz and quartzite, as well as of the other raw materials observed in the archaeological sites in interface with the landscape and the territories - understood from the characterization of the space – pointed out similar and dissimilar elements in the comparison of the horizons analyzed, which gave rise to interpretations of the management of the raw materials, of the operative chains and technological organization, and of the function of the archaeological sites.
- The results allowed, opportunely, to improve the understanding of potential elements in the landscape that could have contributed to the choice of the sites analyzed, as well as the possible predilection of the prehistoric occupations in the

geological formation Galho do Miguel.
- In exploring the relationships between the archaeological sites, their lithic industries and the space in which they are located, we provided contributions to the knowledge on the populations that occupied the Old and Recent horizons in the region of Diamantina, and to the development of knowledge about the prehistory of Serra do Espinhaço.



Archaeological sites studied: region of Diamantina

Outputs:

Thesis

Cunha, A. C. R., 2017. Arqueologia e Geociências: análise diacrônica da gestão da matéria-prima no espaço prehistorico da região de Diamantina, Minas Gerais, Brasil. Vila Real: Universidade de Trás-os-Montes e Alto Douro.

Reports

1. Cunha, A. C. R.; Tolentino, A.; Moraes, C. G. M. S. M.; Ferreira, L.; Silva, L. S., *Relatório Preliminar: Mapeamento de Processos -DivTec/Iphan/PB*. Instituto do Patrimônio Histórico e Artístico Nacional/ SE Paraíba.

2. Cunha, A. C. R., *Avaliação Técnica* – Relatório: Etapa 01 - Programa de Diagnóstico e Prospecção Arqueológica do empreendimento "Licenciamento Ambiental – Cuité – Construção da Barragem Retiro, no sítio Botente, Zona Rural do Município de Cuité (PB). Instituto do Patrimônio Histórico e Artístico Nacional/ SE Paraíba.

3. Cunha, A. C. R., *Avaliação Técnica* – Projeto de Prospecção e Salvamento Arqueológico do Distrito Industrial de Caaporã/PB. Instituto do Patrimônio Histórico e Artístico Nacional/ SE Paraíba.

4. Cunha, A. C. R., *Avaliação Técnica* – Análise de Ficha de Caracterização de Atividade (FCA) para Classificação do Empreendimento Parque Eólico Canoas 2 – Santa Luzia, São José do Sabugi e Junco do Seridó/Paraíba. Instituto do Patrimônio Histórico e Artístico Nacional/ SE Paraíba.

5. Cunha, A. C. R., *Avaliação Técnica* – Projeto de Complementação de Diagnóstico e Prospecção do Sistema Adutor Acauã-Araçagi/PB. Instituto do Patrimônio Histórico e Artístico Nacional/ SE Paraíba.

6. Cunha, A. C. R., *Avaliação Técnica* – Relatório do Projeto "Avaliação de Impacto ao Patrimônio Arqueológico para a CGH Aliança". Município de Calmon/SC. Instituto do Patrimônio Histórico e Artístico Nacional/ SE Paraíba.

7. Cunha, A. C. R., *Avaliação Técnica* – Projeto de Prospecção Arqueológica da área de lavra da Elizabeth Produtos Cerâmicos Ltda. – Município de Pedra Lavrada/Paraíba. Instituto do Patrimônio Histórico e Artístico Nacional/ SE Paraíba.

8. Cunha, A. C. R., *Avaliação Técnica* – Projeto de Prospecção Arqueológica do Complexo Ecoturístico Reserva Garaú – Praia de Tambaba – Conde/PB. Instituto do Patrimônio Histórico e Artístico Nacional/ SE Paraíba.

9. Cunha, A. C. R., *Avaliação Técnica* – Complexo Eólico Lagoa e Linhas de Transmissão: Projeto de Resgate e Educação Patrimonial do Sítio Caminho, Junco do Seridó e Santa Luzia/PB. Instituto do Patrimônio Histórico e Artístico Nacional/ SE Paraíba.

10. Cunha, A. C. R., *Avaliação Técnica* – Análise de Ficha de Caracterização de Atividade (FCA) para Classificação do Empreendimento Parque Eólico Chafariz 7– Santa Luzia/Paraíba. Instituto do Patrimônio Histórico e Artístico Nacional/ SE Paraíba.

11. Cunha, A. C. R., *Avaliação Técnica* – Análise de Ficha de Caracterização de Atividade (FCA) para classificação do Empreendimento UFV Malta e Usina Solar Fotovoltaica – UFV Angico. Instituto do Patrimônio Histórico e Artístico Nacional/ SE Paraíba.

12. Cunha, A. C. R., *Avaliação Técnica* – Análise de Ficha de Caracterização de Atividade (FCA) para Classificação do Empreendimento Linha de Transmissão Coremas, município de Coremas/PB. Instituto do Patrimônio Histórico e Artístico Nacional/ SE Paraíba.

13. Cunha, A. C. R., *Avaliação Técnica* – Relatório Setorial 03 – Programa de Diagnóstico e Prospecção Arqueológica Complementar – Complexo Eólico Lagoa e Linhas de Transmissão. Santa Luzia, São José do Sabugi e Junco do Seridó/Paraíba. Instituto do Patrimônio Histórico e Artístico Nacional/ SE Paraíba.

14. Cunha, A. C. R., *Avaliação Técnica* – Analisa solicitação de Prorrogação de prazo: Termo de Compromisso º 02/2014 - Projeto Paraíba – Fábrica de Cimentos e Lavras de Calcário e Argila. Caaporã/Paraíba. Instituto do Patrimônio Histórico e Artístico Nacional/ SE Paraíba.

15. Cunha, A. C. R., *Avaliação Técnica* – Avalia Alteração de Equipe de Arqueologia - Programa de Resgate Arqueológico do Projeto Paraíba Fábrica de Cimentos e Lavras Calcária e Argila Votorantim Cimentos S/A – Unidade Caaporã. Caaporã/Paraíba. Instituto do Patrimônio Histórico e Artístico Nacional/ SE Paraíba.

16. Cunha, A. C. R., *Avaliação Técnica* – Relatório Complementar do Diagnóstico de Bens de Interesse Cultural do Projeto Paraíba – Fábrica de Cimentos e Lavras Calcário e Argila da Votorantim Cimentos N/NE S.A. Caaporã/Paraíba. Instituto do Patrimônio Histórico e Artístico Nacional/ SE Paraíba.

17. Cunha, A. C. R., *Avaliação Técnica* – Relatório Setorial 04 e documentos complementares – Programa de Diagnóstico e Prospecção Arqueológica Complementar – Complexo Eólico Lagoa e Linhas de Transmissão. Santa Luzia, São José do Sabugi e Junco do Seridó/Paraíba. Instituto do Patrimônio Histórico e Artístico Nacional/ SE Paraíba.

18. Cunha, A. C. R., *Avaliação Técnica* – Estabelece Medidas Compensatórias para composição e celebração de Termo de Ajuste de Conduta – Achado Fortuito de Urnas Funerárias no bairro Tambor. Cuité/Paraíba. Instituto do Patrimônio Histórico e Artístico Nacional/ SE Paraíba.

19. Cunha, A. C. R., *Avaliação Técnica* – Relatório Final de Arqueologia do Complexo Eólico Lagoa e suas Linhas de Transmissão. Santa Luzia, São José do Sabugi e Junco do Seridó/Paraíba. Instituto do Patrimônio Histórico e Artístico Nacional/ SE Paraíba.

20. Cunha, A. C. R., *Relatório Técnico-Fotográfico: Sítios Arqueológicos Umari e Gruta dos Morcegos. Bananeiras/Paraíba*. Instituto do Patrimônio Histórico e Artístico Nacional/ SE Paraíba.

21. Cunha, A. C. R., *Avaliação Técnica* – Projeto de Arqueologia Preventiva do Distrito Industrial de Caaporã – Relatório de Monitoramento. Caaporã/Paraíba. Instituto do Patrimônio Histórico e Artístico Nacional/ SE Paraíba.

22. Cunha, A. C. R., *Avaliação Técnica* – Relatório Final do Programa de Resgate Arqueológico do Projeto Paraíba Fábrica de Cimentos e Lavras Calcária e Argila Votorantim Cimentos S/A – Unidade Caaporã e complementações. Caaporã/Paraíba. Instituto do Patrimônio Histórico e Artístico Nacional/ SE Paraíba.

23. Cunha, A. C. R., *Avaliação Técnica* – Estabelece Medidas Compensatórias para composição e celebração de Termo de Ajuste de Conduta – Construção da Barragem Retiro, sítio Botente. Cuité/Paraíba. Instituto do Patrimônio Histórico e Artístico Nacional/ SE Paraíba.

24. Cunha, A. C. R., *Relatório Técnico-Fotográfico: Sítio ArqueológicoTapuio (São José do Sabugi/PB) e Sítio Arqueológico Pedra Lavrada (Ouro Branco/RN)*. Instituto do Patrimônio Histórico e Artístico Nacional/ SE Paraíba.

25. Cunha, A. C. R., *Relatório Técnico-Fotográfico: Instituição de Guarda e Pesquisa de Material Arqueológico – LABAP/Universidade Estadual da Paraíba*. Instituto do Patrimônio Histórico e Artístico Nacional/ SE Paraíba.

26. Cunha, A. C. R., *Relatório Técnico-Fotográfico: Instituição de Guarda e Pesquisa de Material Arqueológico – NDIHR/Universidade Federal da Paraíba*. Instituto do Patrimônio Histórico e Artístico Nacional/ SE Paraíba.

27. Cunha, A. C. R., *Relatório Técnico-Fotográfico: Instituição de Guarda e Pesquisa de Material Arqueológico – Museu Regional de Areia*. Instituto do Patrimônio Histórico e Artístico Nacional/ SE Paraíba.

Territory, identity and knowledge in traditional communities: the Quilombos of Itamatatiua and Santo Inácio and the relationship with its natural and social environment

Milena das Graças Oliveira Reis[1]

(1) Universidade de Trás-os-Montes e Alto Douro, Instituto Terra e Memória de Mação/Centre of Geosciences of Coimbra, Lg. Infante D. Henrique 6120-750 Mação, Portugal.

Project type: PhD research at UTAD, funded by the Foundation for Support of Research of Maranhão, (Brazil) and supported by ITM

Leader: Milena Reis

Coordination: Luiz Oosterbeek

Team: Milena Reis and Luiz Oosterbeek

Institutions involved: University of Trás-os-Montes e Alto Douro, Instituto Terra e Memória

Goals: This thesis studies the notions of space, time and causality in the quilombola communities of Santo Inácio and Itamatatiua, in Alcântara, Maranhão, under the aegis of Archeology, Landscape Management and Social Representations, addressing these sites under various themes, such as territorial organization, relations of power, material and immaterial culture and economy. Thus, the work took place as a way of responding if more integrated communities with greater mastery of modern notions of space, time and causality have greater capacity for development and resilience.

Results:

- The study evidenced two similar communities as traditional spaces, recognized as quilombolas, but different as to how they list their daily life and look at the space to which they belong.

- On the one hand, Itamatatiua whose structure and territoriality follow a more cohesive and participatory dynamics, thinking about its local knowledge and interacting with internal and external perspectives; and on the other, a Saint Ignatius who walks in parallel, respecting his steps and nevertheless, also open to resignifications.

Manioc traditional production.

Outputs:

Thesis

1. Reis, M. G. O., 2017. *Território, identidade e conhecimento em comunidades tradicionais: os quilombos de Itamatatiua e Santo Inácio e a relação com seu entorno natural e social*. Vila Real: Universidade de Trás-os-Montes e Alto Douro.

The lithic matrices in the Muisca goldsmith craftmanship. Art, technique and processes

Carlos Rodriguez[1]

(1) Universidad de Extremadura, Instituto Terra e Memória de Mação/Centre of Geosciences of Coimbra, Lg. Infante D. Henrique 6120-750 Mação, Portugal;

Project type: Ongoing PhD research project.

Leader: Carlos A. Rodriguez. M

Coordination: José Júlio Garcia Arranz and Luiz Oosterbeek

Team: Carlos Rodriguez, José Júlio Garcia Arranz and Luiz Oosterbeek

Institutions involved: Universidad de Extremadura, Instituto Terra e Memória de Mação, GIPRI-Colombia

Goals: To study all of the Muisca gold matrices materials, both those in national museums in Colombia and those found in private collections, as well as pieces that are in international collections, in Madrid-Spain, Paris-France and in Berlin Germany.

Objectives include to:

1- Make a complete catalog of goldsmith matrices.

2- Identify the rocks with which the matrices were made.

3- Identify, as far as possible, their geological origin.

4- Determine the manufacturing processes, identifying the possible tools used to make the engravings of the matrices.

5- Discuss precisely the problem of technique and art in prehistory, from the horizon of the Muisca goldsmiths.

6- Discuss the position of the goldsmiths in the Muiscas' groups.

7- Understand the function and place of the goldsmith's pieces in the social and material world of the Muisca people.

Outputs:

The project is now starting, at the Universidad de Extremadura (Spain).

Ongoing PhD research project.

Geoarchaeological investigations in Southwestern Angola: macro and micro-scale approaches to the Middle and Late Pleistocene of Leba Cave

Daniela de Matos[1,2]

(1) Institute of Archaeological Sciences, University of Tübingen, Rümelinstr. 23, 72070 Tübingen, Germany; daniela.de-matos@uni-tuebingen.de

(2) Instituto Terra e Memória de Mação/Centre of Geosciences of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal;

Project type: Doctoral project funded by the Foundation of Science and Technology SFRH/BD/117162/2016 (since June/2017)

Leader: Daniela de Matos

Coordination: Christopher E. Miller, Nicholas J. Conard and Luiz Oosterbeek

Team: Daniela de Matos, Christopher E. Miller, Nicholas J. Conard, Ziva Domingos, Manuel Sahando Neto, Luiz Oosterbeek, Pierluigi Rosina, Chantal Tribolo and Norbert Mercier

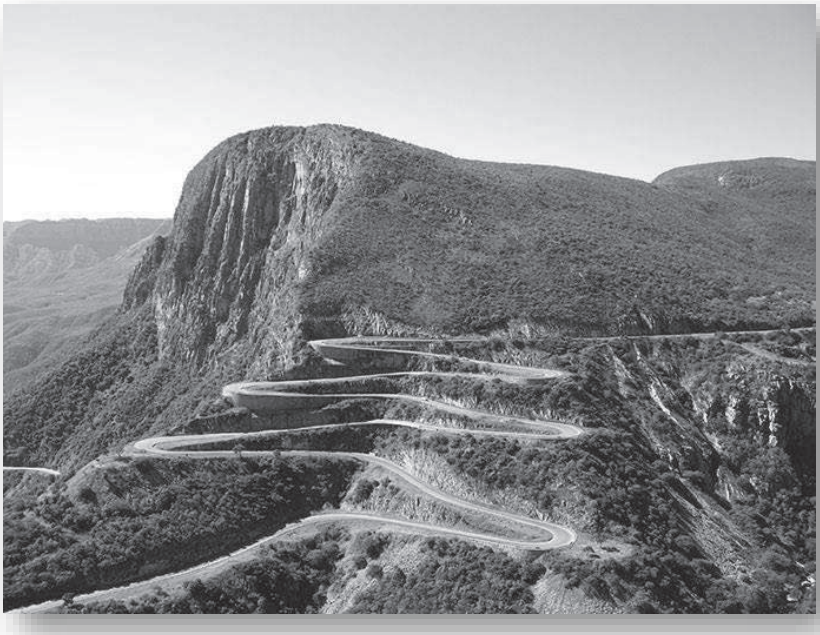
Institutions involved: Institute of Archaeological Sciences of Tübingen, Geosciences Center of the University of Coimbra, Instituto Politécnico de Tomar, Instituto Terra e Memória de Mação, Instituto Superior Politécnico da Huíla, University Mandume Ya Ndemufayo do Lubango, Direcção Nacional de Museus de Angola

Goals: Geoarchaeological reassessment of Middle Stone Age sites in Leba Karst, Geochronology and Analysis of Site Formation processes through Micromorphology; Palaeoenvironmental and Technological patterns in the formation of Culture and Adaptation to Ecological niches in the Middle and Late Pleistocene of Southwest Angola.

Outputs:

Communications

1. Matos, D., 2017. Why apply a Geoarchaeological Approach to the Middle and Late Pleistocene of Leba Cave?, *7th Annual meeting of the European Society for the study of Human Evolution* (ESHE), 20th-24th September, Leiden, NL.



Serra da Leba - Angola - Africa

Rock Art and landscape: an empirical analysis in the content, context and distribution of the rock art sites in Omandumba East and West, Erongo Region-Namibia

Alma Mekondjo Nankela[1]

(1) Universidade de Trás-os-Montes e Alto Doutor, Muséum National d'Histoire Naturelle, Instituto Terra e Memória de Mação/Centre of Geosciences of Coimbra, Lg. Infante D. Henrique 6120-750 Mação, Portugal.

Project type: PhD research, funded by the Erasmus Mundus programme (Erasmus Mundus Quaternary and Prehistory).

Leader: Alma Mekondjo Nankela

Coordination: Luiz Oosterbeek, François Sémah and David Pleurdeau

Team: Alma Mekondjo Nankela, Luiz Oosterbeek, François Sémah and David Pleurdeau

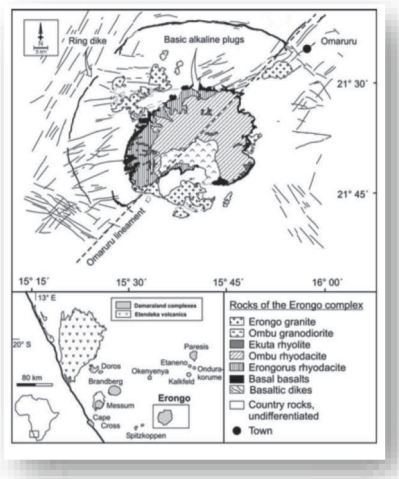
Institutions involved: University of Trás-os-Montes e Alo Douro, Muséum National d'Histoire Naturelle, Instituto Terra e Memória de Mação, Ministry of Culture of Namibia

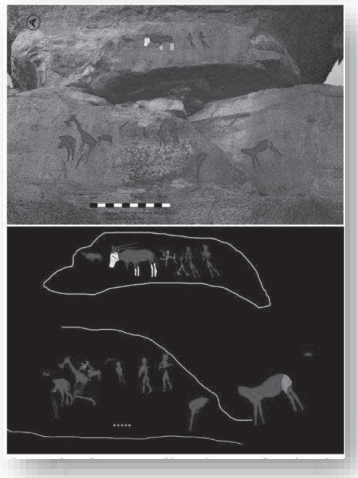
Goals: The central objective of the study was to establish whether the spatial distribution of rock art in Omandumba in the Erongo Mountains has a density comparable to those other well-researched sites. To achieve this, this study adopted a contextual approach to the study of rock art in relation to its landscape. An interdisciplinary framework was adopted: data obtained from archaeology, bioarchaeology, ethnography, ethno-history, geology, geography, paleoenvironment, GIS and zooarchaeology.

Results:

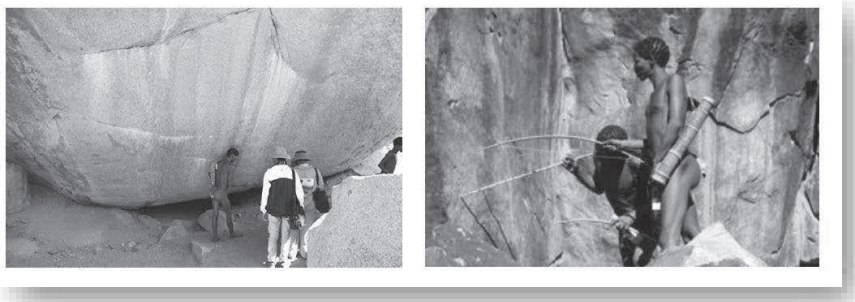
- The study has demonstrated that the Omandumba has a potential for providing absolute chronology of the rock art based on the set of organic pigments albeit in small quantity collected from some painting sites, as well as relative chronology based on superimpositions of both engravings and paintings. This study, however, has contributed to the general knowledge of the rock art corpus of the Erongo Mountains through an empirical documentation of the rock art and its associated archaeology as a first step.

- The study has also demonstrated that research of this nature can only be achieved when local heritage institutions promote and create avenues where collaborations with various research institutions, universities and the involvement of local communities around the sites is encouraged.





Left: Geological map of the Erongo ocmplex. Right: Reconstruction of paintings.



Two images of field work undertaken with the collaboration of San people.

Outputs:

Thesis

1. Nankela, A. M., 2017. *Rock Art and landscape. An empirical Analysis in the content, context and distribution of the rock art sites in Omandumba East and West, Erongo Region-Namibia*. Vila Real, Universidade de Trás-os-Montes e Alo Douro.

Ornithopod dinosaurs from the Lower Cretaceous of the Papo-Seco Formation (Sesimbra): its regional and national context

Silvério Figueiredo[1]

(1) Centro de Geociências da Universidade de Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; Instituto Politécnico de Tomar, Quinta do Contador. Estrada da Serra. 2300-313. Tomar. Portugal; Centro Português de Geo-História e Pré-História. Largo de São Caetano,2150-265 Golegã, Portugal
silverio.figueiredo@ipt.pt

Project type: Post-doctoral project

Leaders: Silvério Figueiredo

Coordination: Xabier Pereda Suberviola

Team: Silvério Figueiredo

Instituitions involved: Geosciences Center of the University of Coimbra, Instituto Terra e Memória and Centro português de Geo-História e Pré-História.

Goals: The work to develop for this postdoctoral project will focus on a set of fossil remains collected during the investigations carried out by the Portuguese Center of Geo-history and prehistory (CPGP), in the PapoSeco Formation (Cabo Espichel, Sesimbra) between the years of 1998 and 2015. Its main objectives are:

1 - Obtain new data about the presence of ornithopod dinosaurs of the Lower Cretaceous, in Portugal;

2 - Study of a skeleton of an ornithopod found on deposit from the Boca do Chapim site. Given the scarcity and the fragmentation of ornithopods from the Cretaceous of Portugal, this finding is as well as the most complete skeleton of the Cretaceous Portuguese ornithopods. The fact that this skeleton has been found in stratigraphic context reinforces the importance of these remains in the context of the fossil record of the Portuguese dinosaurs from the Cretaceous;

3 - Framing these studies in the context of the occurrence of this group of dinosaurs in the Lower Cretaceous in Portugal.

Results:

The occurrence of vertebrate fossils, especially dinosaur, in the area of the Espichel is referenced in scientific literature since the 19th century. Under the early work of geological survey of Portugal were found in Espichel some early remains of dinosaurs and other reptiles (Sauvage, 1897-98). In the 20TH century Lapparent and Zbyszewski (1957) referred to the presence of Iguanodon in the Papo-Seco Formation. Recent paleontological research provided the discovery of new remains of vertebrates, including several fragments of tortoise's shell, crocodile, pterosaurs and fish teeth, and several

bones and teeth of dinosaurs. It was possible identify, among the remains of dinosaurs, fossils of *Baryonyx*, *Iguanodon* and sauropods, these new findings are an important contribution to the knowledge of the diversity of the Portuguese cretaceous vertebrates.

Having regard to the importance of this set of remains of ornithopod, this work aims to describe, characterize and contextualize stratigraphically this set of new ornithopod dinosaur fossils found.

In addition to the remains of ornithopod, was discovery an extensive set of skeletal remains of vertebrates, including several teeth and bones of other dinosaurs, pterosaurs, crocodiles, turtles, fish and various internal molds of invertebrates (bivalves and gastropods). It was also discovered a cast of a ornithopod dinosaur footprint in this formation. The scientific results of this work have been published in international scientific journals in recent years.

Excavating work in the ornithopod dinosaur of Boca do Chapim site (The main research object of this project) and detail of a rib of that dinosaur.

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AN INTERNATIONAL PUBLICATION OF EARTH SCIENCES

Dinosaurs and other vertebrates from the Papo-Seco Formation (Lower Cretaceous) of southern Portugal

S. Figueiredo[1,2,3*], P. Rosina[1,3], L. Figuti[4]

[1]*Unidade Departamental de Arqueologia, Conservação e Restauro e Património do Instituto Politécnico de Tomar, Quinta do Contador - Estrada da Serra, 2300-313 Tomar, Portugal.*
[2]*Centro Português de Geo-História e Pré-História – Prct. Campo das Amoreiras, Lt: 1 – 2°O – 1750-021 Lisboa, Portugal.*
[3]*Centro de Geociências da Universidade de Coimbra, Rua Silvio Lima, Univ. Coimbra - Pólo II, 3030-790 Coimbra, Portugal*
[4]*Museu de Arqueologia e Emologia da Universidade de São Paulo, Avenida Prof. Almeida Prado, 1466 - São Paulo SP, 05589000, Brazil*

*e-mail addresses: silverio.figueiredo@ipt.pt (SF; * Corresponding author); prosina@ipt.pt(PR); silverio.figueiredo@cpgp.pt(SF); lfiguti@usp.br(LF)*

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Abstract

New vertebrate remains reported from the Papo-Seco Formation (Lower Barremian, Lower Cretaceous) of Areias do Mastro, in Cabo Espichel, SW Portugal, south of Lisbon. The marine, lagoonal, and estuarine limestones, marls, sands and gravels have yielded remains of dinosaurs and other reptiles since the 19th century. Recent paleontological prospecting produced several vertebrate remains, including turtle shell fragments, crocodilian teeth, fish and pterosaurs. Research identified both bones and teeth of fish, crocodiles, dinosaurs *Baryonyx* and iguanodontian, as well as a ctenochasmatoid pterosaur, and a possible ornithocheirid pterosaur. These new disclosures are an important contribution to the knowledge of vertebrate diversity from the Portuguese Cretaceous. Faunal species combination proven to be similar to other faunal associations of Barremian formations in the Iberian Peninsula.

Keywords: Early Cretaceous, vertebrates, dinosaurs, pterosaurs, Espichel, Portugal

Resumen

Se presentan nuevos restos fósiles de vertebrados de la formación Papo-Seco (Barremiense inferior, Cretácico Inferior), en el yacimiento de Areias do Mastro, SW de Portugal, al sur de Lisboa. En las margas, arenas, areniscas y calizas de origen marino y estuarino de esta formación localizada en el Cabo Espichel, y ya desde el siglo XIX, se han encontrado restos de dinosaurios y otros reptiles. Recientemente, nuestra prospección sacó a la luz varios restos fósiles de vertebrados, entre los que se incluyen fragmentos de caparazón de tortuga, dientes de cocodrilo, de peces actinopterigios y de pterosaurio (ctenocasmatoideo y posiblemente ornitoqueiroideo), así como algunos huesos y dientes de dinosaurios. Hemos identificado restos de Baryonyx y de ornitópodos iguanodontios. Su descubrimiento representa una importante contribución al conocimiento de la diversidad de vertebrados existentes en el Cretácico portugués. La combinación de las especies muestra ser similar a otras asociaciones de la fauna de las formaciones Barremienses en la Península Ibérica.

Palabras clave: Cretácico Inferior, vertebrados, dinosaurios, pterosaurios, Espichel, Portugal

Article about the investigations into cretaceous vertebrates from the Papo-Seco Formation, published in the Journal of Iberian Geology, in 2015.

Outputs:

Articles

1. Figueiredo, S.; Rosina, P.; Figuti, L., 2015. Dinosaurs and other vertebrates from the Papo-Seco Formation (Lower Cretaceous) of southern Portugal. Journal of Iberian Geology 41(3):301-314.

2. Figueiredo, S.; Rosina, P.; Belo, J., 2016. A new record of an ornithopod footprint in Lower Cretaceous of Cabo Espichel (Sesimbra, Portugal). In ICHNIA 2016 Abstract Book, (Ed.: Andrea Baucon, Carlos Neto de Carvalho, Joana Rodrigues), pp.246-247.

3. Figueiredo, S.; Strantzali, I.; Rosina, P.; Gomes, M., 2016. New Data about the Paleo Environment of the Papo-Seco Formation (Lower Cretaceous) of Southern Portugal. Journal of Environmental Science and Engineering A 5 (2016) 463-470 http://dx.doi:10.17265/2162-5298/2016.09.004.

4. Figueiredo, S.; Strantzali, I.; Gomes, M.; Pimenta, R.; Santos, M., 2017. Preliminary Data of New Dinosaurs and Turtles Remains from the basal Deposits of the Papo-Seco Formation in Areias do Mastro's Quarry (Cabo Espichel - Portugal). Arvana.

5. Figueiredo, S.; Dinis, P.; Rosina, P.; Belo, J.; Strantzali, I., 2017. A new record of a possible ornithopod footprint from the Lower Cretaceous of Cabo Espichel (Sesimbra, Portugal). Bollettino della Societa Paleontologica Italiana.

Territory, Heritage and Tourism - TPT - Project IPT/l-tour.ipt – IPG

Luís Mota Figueira[1], Manuel Salgado[2], João Pinto Coelho[3], Ilídio Ramos[4]

(1) Polytechnic Institute of Tomar, Estrada da Serra, Campus da Quinta do Contador, 2300-313 Tomar, Portugal. Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal.

(2) Polytechnic Institute of Guarda, Rua Dr. José António Fernandes Camelo, Arrifana, 6270-372 Seia, Portugal. Research Centre GOVCOPP, University of Aveiro.

(3) Polytechnic Institute of Tomar, Estrada da Serra, Campus da Quinta do Contador, 2300-313 Tomar, Portugal.L-tour.ipt.

(4) Polytechnic Institute of Guarda, Rua Dr. José António Fernandes Camelo, Arrifana, 6270-372 Seia, Portugal.

Project type: Research and Innovation and editorial proposal

Coordination: Luis Mota Figueira; Manuel Salgado

Team: Luís Mota Figueira, Manuel Salgado, João Pinto Coelho, Ilídio Ramos

Institutions involved: Polytechnic Institute of Toma (l-tour.ipt – Tourism Lab); Polytechnic Institute of Guarda; Geosciences Centre of the University of Coimbra; Agricultural Museum of Riachos; HIGHSUN-Portuguese Tour Operator and DMC

Goals: The project intends to study the territory, the local and regional heritage in touristic perspective and to contribute for growth in religious tourism. Intends to draw make an equestrian route as a tourist product. Through the editorial process and their dissemination between the people and visitants in order to creating more qualification to oriented to the territory, to the people and to the organizations, is possible to produce more value for all.

Results:

The editorial proposal in essay form aims to constitute itself as a contribution in the construction of a specific theoretical framework of tourism and cultural management. It is proposed to observe this domain according to the "Territory-Heritage-Tourism" model (TPT) to be developed under the following justification:

1. The Territory is consumed by Tourism in various ways and in accordance with diverse needs of the economic sector generated and developed by this economic activity. The process of territorial touristification involves People, Organizations and Knowledge. The adaptation of the territory to accommodate the tourist activities constitutes in itself an area in which the planning of the territory requires,

in this logic of accommodation, a consequent tourist planning;

2. Heritage is appropriated by Tourism, both of natural origin (natural heritage), and of what has been and continues to be created by society (cultural heritage). Thus, elements with concrete materiality, and other elements defined by their immateriality, are part of the historical heritage and are resources orientable to the tourist function. Life stories and the arts and crafts are revelations of the knowledge's, capacities, and abilities of the People of each place and their history. The use of the natural and cultural resources for their transformation into tourist attractions requires, in the public sphere as well as in the private sphere, knowledge and initiative, financial investment and legal and social framework;
3. Tourism as an economic activity and cultural phenomenon with positive and negative implications on society, natural environment and economy, consumes territory and heritage, generates tourism heritage and wealth and, in this logic, deserves conceptual attention and commercial attention, in particular in the tripartite dimension TPT - Territory, Heritage and Tourism. Through the framework that states and their public administrations determine in terms of policy measures inspired by the UN and UNESCO and its bodies, namely the World Tourism Organization (in doctrinal and ethical terms), this is a field that has much to discover, specifically through the territorial dynamics of the local governments. In this logic the creation / dissemination of knowledge is strategic.

Left: Poster announcing the equestrian pilgrimage/ Right: Aspects of pilgrimage and its popular involvement (2017).

Heritage and the City: trends and challenges of integrated and sustainable management of the city of São Filipe

José Jorge Vieira Moreira[1]

(1) Universidade de Cabo Verde, Instituto Terra e Memória de Mação/Centre of Geosciences of Coimbra, Lg. Infante D. Henrique, 6120-750 Mação, Portugal.

Project type: PhD ongoing research at the University of Cabo Verde

Leader: José Jorge Vieira Moreira

Coordination: Luiz Oosterbeek

Team: José Jorge Vieira Moreira and Luiz Oosterbeek

Institutions involved: University of Cabo Verde, Instituto Terra e Memória de Mação

Goals: To understand if cultural tourism in the city of São Filipe represents effectively a base for economic growth compatible with the environmental balance.

Specific objectives are:

1. To understand the relations that are established between the environmental / cultural heritage and the city;
2. To recognise the proposals of cultural activities of the city;
3. To understand the existing classification policies in the country and their translation into the city;
4. To know the resources allocated to the management of the environment and culture;
5. To design proposals for policy measures conducive to the sustainable development of the city;
6. To identify interactions between cultural heritage and the dimensions of socio-cultural matrix, economic activities and territorial governance.

Historical centre at São Filipe (Fogo island, Cape Vert).

Intangible Heritage of Cape Vert.

Evaluation of the efficiency of altitudinal zones natural parks management in the Santiago, Fogo, S. Nicolau, Santo Antão and S. Vicente islands: a contribution for the sustainability of the Cape Verde Protected Areas National Network

Manuel Leão Silva de Carvalho[1]

(1) Direção Nacional do Ambiente do Ministério da Agricultura e Ambiente, Chã de Areia do Concelho da Praia – Cidade da Praia, República de Cabo Verde; leaocarvalho21@yahoo.com.br; manuel.carvalho@student.unicv.edu.cv

Project type: PhD

Leaders: Manuel Leão Silva de Carvalho

Coordination: Judite de Nascimento, Luiz Oosterbeek

Instituitions involved:

IPT, University of Cape Verde and other Universities part of the *Rede de Estudos Ambientais dos Países da Língua Portuguesa* (REALP), having four Brazilian, four Portuguese, one Angolan and one Mozambican universities as partners

Goals: Expected to be finished in 2019, this PhD project focus the following thematic: (i) quality of Natural Parks managements, the object of this research, in terms of its management efficiency, in order to reach the objectives that guided their creation; (ii) the use of a methodological procedure to evaluate the efficiency of their management; (iii) the evolvement of communities that inhabit the interior and/or damping area of these parks in the management and financial compensation for the loss of revenue due to the creation of the parks; (iv) the influence of poverty and instruction levels in the conservation of the parks resources.

- To identify and integrate the main partners with historical or actual interest in the Parks in the evaluation process and analyse their perception on the degree of efficiency of the management instruments, its management and cooperation parts, whose activities are still ongoing;
- To update and complement the knowledge of the Parks in face of the studies, scientific research and technical works developed;
- To establish indicators to be used in the qualitative and quantitative evaluation of the Parks management efficiency;
- To test and apply a methodology that uses strict indicators in order to evaluate the Parks management efficiency, managed by the National Environment Direction;
- To identify finished and/or ongoing projects in the interior or the damping zone of the Parks, in the framework of

the internationalization of the opportunities costs in terms of conservation for the communities that inhabit the interior and/or damping zones of the Parks;

- To identify the level of poverty and instruction of the communities that inhabit the interior and/or damping zones of the parks;
- To identify the main internal and external threats incidents on the Parks values;
- To identify the weak and strong points of the Parks that respectively will guide the necessity of bigger investments and efforts, and those who are an institutional example that should be followed.

Outputs:

PhD dissertation in progress.

Project ANCHIETA (Caldeira, ES, Brasil, 2015-17)

Alexandra Figueiredo[1]

(1) Tomar Institute Polytechnic, Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; alexfiga@ipt.pt

Project type: International Archaeological Project

Leader: Alexandra Figueiredo e Luis Muri

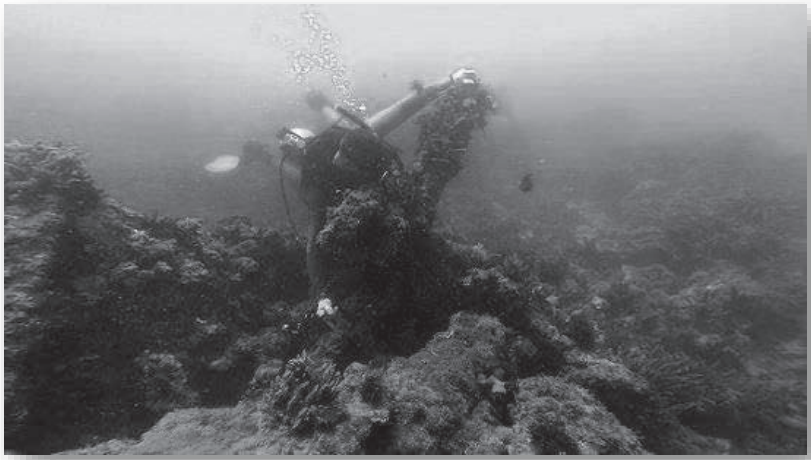
Coordination: Alexandra Figueiredo, Luis Muri

Institutions involved: Polytechnic Institute of Tomar, Windive

Goals: The BOILER project deals essentially with the non-intrusive study and registration of an area where it was possible to record the presence of two shipwrecks. These are located in Anchieta, Espirito Santo State, near the old port, near the coast.

Results: Survey and study of the "Caldeira" wreck site, Espírito Santo, Brazil. Historical record of the possible two vessels observed. Identification of shipwrecks

Submerged structures of Caldeira site



Part of the structures of the iron shipwreck

Outputs:

Articles

1. Figueiredo, A.; Bassani, L., 2017. O sítio arqueológico subaquático da "Caldeira", Anchieta, Espírito Santo: análise preliminar de dois naufrágios. *In Cadernos do LEPAARQ*. Vol. 14, n°27, 2017. ISSN 2316 8412. 366-378 https://periodicos.ufpel.edu.br/ojs2/index.php/lepaarq/article/view/10839

Web-resources

https://www.facebook.com/LabACPS/

The regulation of trade in mobile goods of antiquity as a service in the general framework of the territorial protection of cultural goods

Henrique Augusto Mourão[1]

(1) Instituto Terra e Memória de Mação/Centre of Geosciences of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal.

Project type: PhD research (University of Cordoba)

Leader: Henrique Mourão

Coordination: Luiz Oosterbeek

Team: Henrique Mourão and Luiz Oosterbeek

Institutions involved: Universidad de Cordoba, Instituto Terra e Memória de Mação

Goals: The general objective is to examine the means and international legal instruments dealing with the possession of movable property of antiquity and the participation of individuals (organized in groups or not) in the management, promotion and protection of these assets. This objective presupposed knowing the legal status of these assets and discussing the legal problem related to their property, evaluating the implications of granting exclusivity of ownership and, therefore, guardianship and protection to the States, as well as the implications of granting the right property to individuals.

Specific objectives of the work are to demonstrate that trade of artifacts from the past is not in itself responsible for the difficulties involved in the protection of this heritage and, as a result, to propose recommendations concerning circulation of movable antiquity objects through trade.

Results:

- In depth examination of the means and international legal instruments dealing with the possession of movable property of antiquity and the participation of individuals (organized in groups or not) in the management, promotion and protection of these assets;
- Proposal of negotiation of a new international policy of recommendations concerning the circulation of the arts and antiquities, so that these goods can effectively be treated as universal heritage.

Outputs:

Communications

1. Mourão, H. A., 2017. Implicações da Convenção da UNESCO de 1970 para a posse e gestão privada dos bens móveis da antiguidade. *REPATS - Revista de Estudos e Pesquisas Avançadas no Terceiro Setor.* Brasília: Universidade Católica de Brasília. V. 4, N. 1 Jan/Jun (2017), pp. 842-867

Conferences

1. Session organized at the *Jornadas Iberoamericanas de Arqueologia e Património*, Mação, Portugal, march 2017;

2. Session organized at the *World Humanities Conference*, Liège, Belgium, august 2017.

Digital technologies for the fruition and promotion of prehistoric heritage and archaeological research

Maria Nicoli[1]

(1) Department of Humanities, University of Ferrara, Corso Ercole I d'Este, 32 - 44121 Ferrara, nclmra@unife.it

Project type: PhD ongoing research

Leaders: Maria Nicoli

Coordination: Luiz Oosterbeek

Team: M. Nicoli, L. Oosterbeek, M. Fabbri and E. Borasio

Instituitions involved: University of Ferrara (Italy), Instituto Terra e Memoria de Mação (Portugal), TryeCo 2.0 srl, WeAR srl

Goals: Public Archaeology. Creation and transmission of skills and knowledges; use and management of ICT technologies for cultural heritage. Designing a strategy using gesture technologies against alienation mechanisms. Combining technological skills and academic knowledge in order to promote cultural heritage and reinforce critical reasoning.

Results:

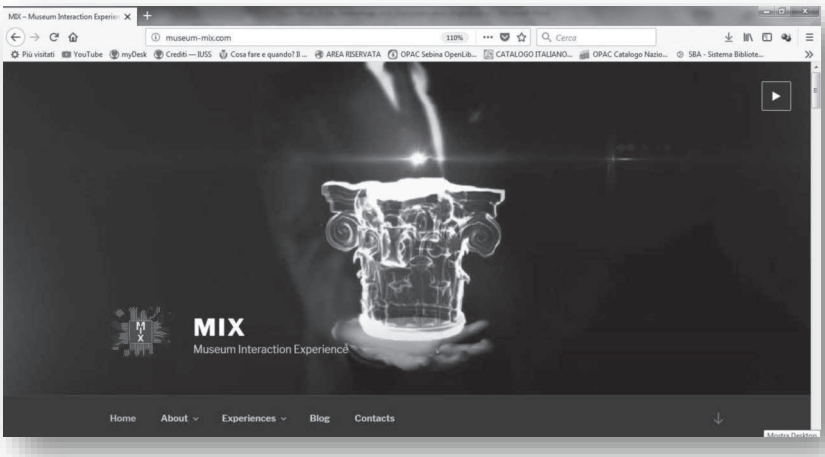
- Participation in the 2nd ARTEM Organizational Creativity and Sustainability International Conference (Nancy, 14-16.09.17)

- Participation in Maker Faire (New York, 23 and 24.09.2017)

- Participation in Erasmus Intensive Program (Apheleia) - Education, Training and Communication in Cultural Management of Landscapes (Mação, 29-7.04.2017)

- Participation in Encontro Ciência ’17 (Lisboa 3-5.07.2017)

- Submission and publication of articles and book chapters.



The home page of the web site of the project that groups all the information about objectives, partners, experiences, contacts and so on.

Outputs:

Book chapters (in press)

1. Capítulo 5. Análisis de los pigmentos del dolmen de Soto. Las manifestaciones gráficas rupestres en el Dolmen de Soto (Trigueros, Huelva). Junta de Andalucía. Consejería de Cultura

2. Capítulo 7: Sondeos arqueológicos en La Calderita: resultados preliminares.

Articles (in press)

1. Para além da gestão patrimonial. (Congresso AAP 2017)

Communications

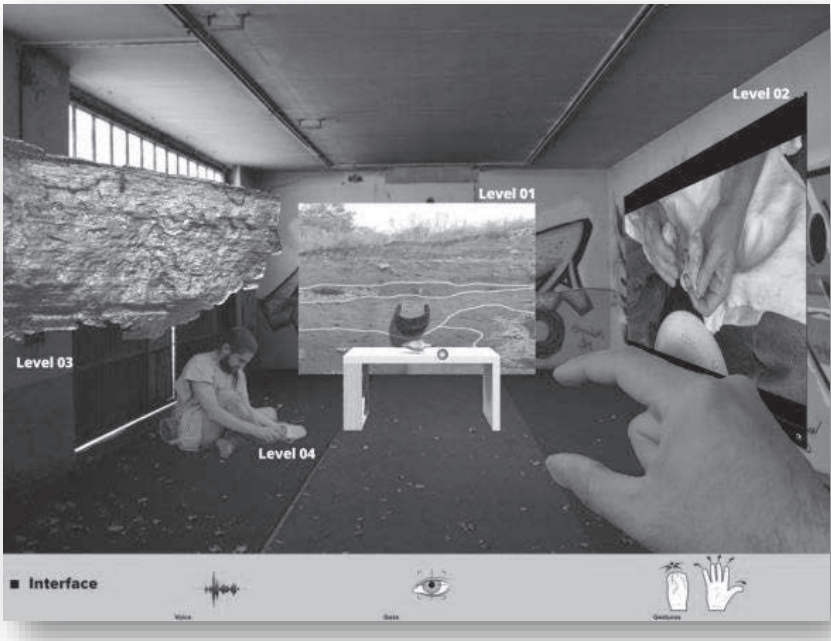
1. Promotion of prehistoric archaeological sites: issues and educational potential. (Apheleia 2017)

2. Digitangibility: a digital prehistory for a sustainable society. (Artem OCC 2017)

Poster

1. A portable augmented museum. A gestual prehistory for education (Encontro Ciencia ’17)

The conceptual system of the app "Digital Prehistory", designed for mixed reality wearable devices (Microsoft Hololens®).



The render of the user interface with four levels of contents: 1. Archaeological record; 2. Operational chain; 3. Resources and cultural landscape; 4. Use.

World Humanities Conference. Challenges and Responsibilities for a Planet in Transition (Liège, Belgium, 6-11 august 2017)

Luiz Oosterbeek[1]

(1) Polytechnic Institute of Tomar, Estrada da Serra, Campus da Quinta do Contador, 2300-313 Tomar, Portugal. Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal. Earth and Memory Institute, Largo infant D. Henrique, 6120-750 Mação, Portugal; loost@ipt.pt

Project type: International Conference

Leader: Adama Samassékou

Coordination: Luiz Oosterbeek, John Crowley, Chao Gejin, Adama Samassékou, Robert Halleux, Jean Winand and Go Okui

Team: very large team, including several members from CGEO, in the framework of the collaboration between UNESCO and the International Council for the Philosophy and Human Sciences (CIPSH). Over 1.000 participants from more than 60 countries from all continents. More than 25.000 participants at distance (via social media online direct accesses)

Instituitions involved: UNESCO, CIPSH, most international scholarly federations of the Humanities, Liège Foundation, CGEO (through Instituto Terra e Memória), Global Chinese Arts and Culture Society, Government of Belgium, Regional government of Wallonia, Tencent, Latin American Council for Social Sciences. Participation also from ICSU (International Council of Science) and ISSC (International Council of Social Sciences)

Goals: The World Humanities Conference (WHC) intended to engage all fields of knowledge in all countries in order to develop global thinking on the role and scope of the humanities in contemporary societies, with the aim of fostering their re-foundation. The Conference focused on dealing with planetary challenges from the perspective of the humanities: population increase, territorial reorganizations, migration, energy and environmental constraints, cultural standardization in the light of globalization and, conversely, the structuring of new identities and the emergence of an often dualized digital society. The WHC was part of a long preparation process, with preparatory regional thematic conferences in Brazil (October 2016, focusing on managing landscapes and humanities), Lebanon (May 2017, focusing on history), in Jamaica (June 2017, on questions of history and culture) and in Mali (June 2017, focusing on languages, cultures and history, in their relations with territories). In addition, specific events

by disciplines have taken place in Mação, Portugal (Sustainability and Landscape Management, April 2016 and March 2017), Ulaanbaatar, Mongolia (Rock Art: History, Memory and Dialogue, May 2016), in Macau, China (Taihu Forum, June 2016), in Santa Maria, Brazil (Borders and Migrations, November 2016), in Hong-Kong (Asian New Humanities Seminar, December 2017), in Shanghai (Shanghai Forum, May 2017), in Paris (Materialities, June 2017). CGEO (through IPT and ITM), was particularly active in the events of Portugal and Brazil, too.

Results:

- Institutional**:** the reinforcement of CIPSH, which included 12 world federations in 2014 and has now 21 members, including one national and three regional ones. This process resumed the role of CIPSH in rendering it a coordinating platform of the Humanities, namely by engaging once again fields of knowledge that left in the past (e.g. psychology) and engaging new fields as well.
- Strategic**:** the establishment of a first contribution for a state of the art of the human sciences in the various countries, regions and cultural traditions, organizing the focus of discussion of the relevance of the humanities under six main themes of wider society concern: climate and environmental changes; cultural identities and diversity; borders and migrations; heritage; history vs. memory; other relevant dimensions of impact (such as digital humanities).
- Networking: improvement on the collaboration among the different converging agendas not only of the member organizations but also of other institutions and, primarily, UNESCO initiatives (e.g. the climate agenda, the UNESCO chairs, etc.) and IYGU.
- Organic: establishing several new interconnected UNESCO Humanities' chairs, engaging over one hundred universities, as a main foundation for rendering effective the initiatives of the academic federations, through the engagement of new generations and society at large.
- Programmatic: building a new course anchored in what is becoming a road-map for the humanities, of which this publication is a major component. Several projects are being structured within this road-map, including specific projects on Global Humanities Report, on Global History of Humankind, on Digital Humanities, on outreach approaches, and on provision of guidelines for policy makers concerning the main research priorities of the Humanities, education key drivers and tools and methodologies for interacting with daily concerns and societal challenges.

Poster indicating one of the entrances to the Conference, displaying CGEO logo.

LIEGE 2017

WORLD HUMANITIES CONFERENCE

Challenges and Responsibilities for a Planet in Transition

CGEO logo

From left to right: Nada Al-Nashif (Assistant Director-General of UNESCO), Luiz Oosterbeek (IPT, CGEO and Secretary-General of CIPSH) and Mathilde Cracker, Maria Nicoli, Jakub Topor, Naorki Goto, Mark Van Der Woude (students of IPT and UniFe, who attended and collaborated in the Conference organization, through the partnership with CGEO-ITM).

Outputs:

Book

1. CIPSH and UNESCO 2017. Challenges and Responsibilities for a Planet in Transition. Proceedings of the World Humanities Conference, Liège, Belgium, 6-11 August 2017, CIPSH-UNESCO, ITM, Paris, Mação.

Web-resources

1. www.cipsh.net

2. https://en.unesco.org/events/world-humanities-conference?language=en

3.https://www.facebook.com/search/top/?q=conf%C3%A9rence%20mondiale%20des%20humanit%C3%A9s%2Fworld%20humanities%20conference%20liege%202017

Education, Training and Communication in cultural management of landscapes (29 March – 7 April 2017)

Luiz Oosterbeek[1]

(1) Polytechnic Institute of Tomar, Estrada da Serra, Campus da Quinta do Contador, 2300-313 Tomar, Portugal. Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal. Earth and Memory Institute, Largo infant D. Henrique, 6120-750 Mação, Portugal; nelsonjalmeida@gmail.com; loost@ipt.pt

Project type: International Seminar

Leader: Luiz Oosterbeek

Coordination: Luiz Oosterbeek and Laurent Caron

Team: Luiz Oosterbeek, Helena Henriques, Anabela Pereira, Margarida Morais, Nelson J. Almeida, Pedro Cura, Pierluigi Rosina, Rita Anastácio, Sara Cura and Sara Garcês

Instituitions involved: Instituto Politécnico de Tomar, Friedrich Schiele University of Jena, Muséum National d'Histoire Naturelle, University of Vilnius, Universitá di Ferrara, Universidad de Extremadura, Brno Technical University, Université Jean Monet, CGEO, Vilnius National Library, Comunidade Intermunicipal do Médio Tejo, Município de Mação, Benefits & Profits, Centro Universitario Europeo per i Beni Culturali, Herity International, Instituto Terra e Memória, UNESCO-MOST

Goals: This was the third international seminar on Cultural Integrated Landscape Management. After discussing the theme of sustainability dilemmas (2015) and sociocultural matrices (2016), the main theme of the APHELEIA Seminar in 2017 was the transmission, transference and transformation of knowledge through education, training and communication. The goal was to build a comprehensive framework, engaging natural, human and social sciences.

Results:

- Training through reserch of 50 advanced Master and PhD students.
- Publication of two volumes with over 60 academic contributions, also engaging scholars from several international academic federations.
- Comparison of over 20 case studies from four different continents.
- Allignment with the UNESCO programme of "Global Learning Cities", which as included Mação as the first Portuguese member, since 2016.

Poster of the Seminar

Outputs:

Proceedings

1. Oosterbeek L., Gudauskas R., Caron L. (eds.), 2017. *Education, training and communication in cultural management of landscapes. Transdisciplinary contributions to Cultural Integrated Landscape Management.* Mação: Instituto Terra e Memória, série *Arkeos*, vol. 42.

Book outline

André Soares – *Indigenous making History: The Indigenous ETP at UFSM – Federal University of Santa Maria*

António Carvalho – *Never too old to move: the elderly and the city*

Benno Werlen – *Cultural Dimensions and Politics under Globalized Conditions: Traditionalist orthodoxies vs. constructivist perspectives*

Gaia Marnetto - *Approaching the management's strategy of a site in the UNESCO World Heritage List: the case of the Convent of Christ in Tomar (Portugal)*

Helena Henriques – *Experiences of the International Year of Global Understanding in Portugal*

Helena Zemánková – *Education - From Schools to Museums and Galleries*

Inguelore Scheunemann, Lívia Scheunemann – *The challenges to form teachers in the lifelong learning era*

Isabel Moreels, Jose Júlio Garcia Arranz – *L'art rupestre préhistorique dans la bande dessinée comme ressource didactique : le rôle de l'œuvre graphique d'Éric Le Brun*

Ivo Boháč **–** *Zoo in the 21st century - a conscious relationship with nature and the environment*

Luiz Oosterbeek – *General Introduction. Dilemmas, sociocultural matrices and communication, within Cultural Integrated Landscape Management*

Margalit Berriet – *Art Education*

Maurizio Quagliuolo – *The transmission and related perception of the message(s) as a main component in valuing, preserving and using the Cultural Heritage remains in the framework of the* Quality Management of Cultural Heritage: *the Outstanding Universal Value and the European Heritage Label in the context of present challenges*

Michel Depeyre – *Imaginer le patrimoine européen*

Neide Barrocá Faccio, Luís Antonio Barone – *The contribution of collaborative research and heritage education on the recollection of memory and reinforcement of identity in an indigenous village: reflections of an experience in the western region of São Paulo State (Brazil)*

Pam Peters, Kate Burridge – *Language Education Policy and English in Multilingual Countries*

Renaldas Gudauskas, Saulė Jokūbauskienė – *Interaction of Communication and Education: Road map for Sustainability of inclusive Knowledge Societies*

Renata Sequeira – *Philosophy for children: why?*

Roberto Messias Franco – *Education, training and communication: approaches to environmental public policies in Brazil*

Sara Cura, Vanda Serra, Rosário Whanon – *Non-school learning throughout life in Mação*

Learning skills and understanding cultural diversity: silk roads and sino-western exchanges

Luiz Oosterbeek[1 2]

(1) Geosciences Centre of the University of Coimbra, ITM – Earth and Memory Institute, Largo dos Combatentes 6120-725, Mação;
(2) Polytechnic Institute of Tomar, Estrada da Serra, Campus da Quinta do Contador, 2300-313 Tomar, Portugal
loost@ipt.pt

Project type: Conference

Leaders: Luiz Oosterbeek (IPT-ITM-CGEO) and Chao Gejin (CASS)

Coordination: Luiz Oosterbeek (IPT-ITM-CGEO) and Chao Gejin (CASS)

Team: The whole team of the Centre, in Mação, contributes to the project

Institutions involved: Earth and Memory Institute (ITM); Polytechnic Institute of Tomar (IPT); Geosciences Center of the University of Coimbra (CGeo – UC), Portuguese Academy of History (APH), International Year of Global Understanding (IYGU), International Council for the Philosphy and Human Sciences

Goals: A one-day seminar, to organize the collaboration between the Portuguese and the Chinese teams, with the following programme:

10h30 – Seminar opening

11h20 – Introductory lectures

Wang Wei, CASS – *The Institute of Archaeology: scope, projects and cooperation.*

Luiz Oosterbeek, IPT, ITM, CIPSH – *Revisiting the relations between economy and culture, from the perspective of an archaeologist*

11h50 – Presentation of the new monographic series *Cognitio Temporibus*

14h10 – Wang Wei, Director General and Senior Research Fellow of Institute of Archeology, CASS – *The Silk Road Before Han Dynasty*

14h30 – Nelson Almeida, Research fellow and Secretary of the Board of ITM – Tr*ends in the study of the emergence of productive economies in Eurasia: cross-borders perspectives on diversity and confluence*

14h40 – Zhao Zhijun, Senior Research Fellow of Institute of Archeology, CASS – *New Data and New Issues on eastward spread of wheat into China*

14h50 – Davide Delfino, Consultant of the Iberian Museum of Archaeology and Art of Abrantes, Secretary of the "Metal Ages in Europe" scientific commission of UISPP, Research Fellow of ITM – *The philosophy of warfare. An approach to the classical periods, from East to West*

15h00 – Li Jinxiu, Senior Research Fellow of Institute of History, CASS – *The Trade Circles of Silver Coins and Silver Ingots: The Different Destinies of the Persian Silver Coins in Tang Times*

15h50 – Gustavo Portocarrero, Consultant of the Iberian Museum of Archaeology and Art of Abrantes, Research Fellow of ITM – *The cultural impact of Chinese porcelain imported into Portugal in the 16th and 17th centuries*

16h00 – Huang Shan, Assistant Researcher of Institute of Archeology, CASS – *Porcelain Trade between East Asia and Europe in the 16th and 17th Century*

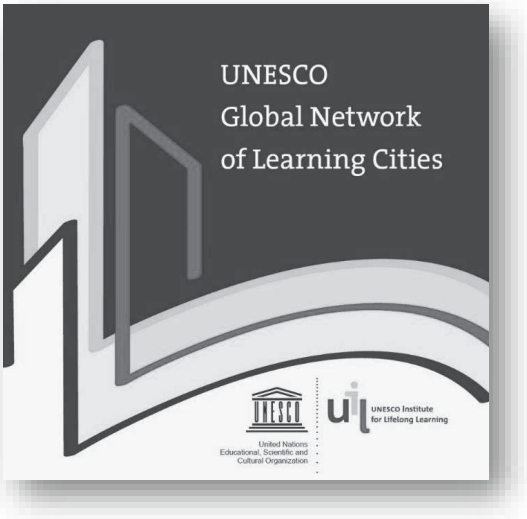
16h10 – Teresa Desterro, Director of the Archaeology, Conservation and Heritage Departmental Unit, Professor of Art History, IPT, CIEBA-FBAUL / ARTIS-FLUL – *Art as a confluence of cultural realities and transculturality*

16h20 – Liu Yihong, Senior Research Fellow of Institute of Philosophy, CASS – *The Features of Islamic Cultures: Viewing from an Intercultural Perspective*

16h30 – Pierluigi Rosina, President of the Scientific Council of ITM, Director of Master Programme in Archaeological Techniques, Professor of Geo-archaeology, IPT – *New roads for understanding our common past: prehistoric research collaboration between IPT, ITM and China*

16h40 – Final debate

17h00 - Closure



The GLC award to Mação

Poster of the event

Outputs:

www.cm-macao.pt/index.php/pt/83-info-municipal/noticias/520-macao-membro-unesco-aprendizagem

Archaeoacoustics III: the Archaeology of Sound (Tomar-Mação, 5-8 october, 2017)

Fernando Augusto Coimbra[1]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; coimbra.rockart@yahoo.com

Project type: International Conference

Leader: Linda Eneix

Coordination: Fernando Augusto Coimbra, Linda Eneix, Luiz Oosterbeek, Josette Portelli.

Team: Fernando Augusto Coimbra, Linda Eneix, Luiz Oosterbeek, Josette Portelli.

Institutions involved: Old Temples Study Foundation, Polytechnic Institute of Tomar, Geosciences Centre, Institute Earth and Memory.

Goals: To promote a multidisciplinary debate on themes such as archaeoacoustics, archaeology, early musical behaviour, architecture, soundscapes and psychoacoustics, among others

Results: Twenty-nine papers presented.

Three extended lectures.

Round table about Archaeoacoustics, carried out at Mação.

Exhibition of contemporary art inspired in rock art and archaeoacoustics, by Rosario Sousa.

Foundation of the International Society for the Study of Archaeoacoustics.

One of the paintings from the exhibition representing a dancing scene from the Neolithic.

Outputs:

Books

1. Eneix, L. (ed.). (*in press*) Proceedings of Archaeoacoustics III: the Archaeology of Sound. OTS Foundation, Myakka City.

Articles

1. Coimbra, F. A.; Oosterbeek, L. (in press) Arqueoacústica - a Arqueologia do Som: memórias de um congresso recente. Al-madan On-line. Centro de Arqueologia de Almada.

Web-resources

www.otsf.org/2017-conference.html

www.archaeoacoustics.org/

Discussion during the Conference conclusions
(Photo: SBRG)

XIII Ibero-American Conference on Archeology and Heritage – JIAP 2017

Luiz Oosterbeek[1], Sara Cura[1], Sara Garcês[1] and Davide Delfino[1]

(1) Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; Earth and Memory Institute, Largo Infante D. Henrique, 6120-750 Mação, Portugal; loost@ipt.pt; saragarces.rockart@gmail.com; davdelfino@gmail.com

Project type: International Scientific Event

Leaders: Luiz Oosterbeek, Sara Cura, Sara Garcês and Davide Delfino

Coordination: Luiz Oosterbeek, Sara Cura, Sara Garcês and Davide Delfino

Team: Luiz Oosterbeek, Sara Cura, Sara Garcês and Davide Delfino

Instituitions involved: Geosciences Center of the University of Coimbra, Earth and Memory Institute; Mação Municipality; Espaço Arqueologia: EBSA; Documento; Universidade Federal de Santa Catarina

Goals: Discuss current themes such as rock art, heritage and archaeological collections.

Results:

Panel 1: "Studies of pieces without archaeological context: importance and case studies" – coordination Davide Delfino, Henrique Mourão, Carlos Rodriguez; - 11 presentations;

Panel 2: “Rock Art” - coordination Sara Garcês; 6 presentations;

Panel 3: “Panel Archaeology and Heritage”; Coordination Sara Cura: 14 presentations;

Outputs:

Event

1. Actas das XIII Ibero-American Conference on Archeology and Heritage – JIAP 2017 [in press]. – Techne 4.

Archaeology, Conservation, Restoration and Heritage (Tomar-Mação, 7-8 november, 2017)

Teresa Desterro[1], Silvério Figueiredo[2], Rita Anastácio[3] and Luiz Oosterbeek[3]

(1) Polytechnic Institute of Tomar, Estrada da Serra, Campus da Quinta do Contador, 2300-313 Tomar, Portugal.

(2)Polytechnic Institute of Tomar, Estrada da Serra, Campus da Quinta do Contador, 2300-313 Tomar, Portugal. Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal. Earth and Memory Institute, Largo infant D. Henrique, 6120-750 Mação, Portugal. Portuguese Center of Prehistory and Geohistory, Largo de São Caetano, 2150-265 Golegã, Portugal; silverio.figueiredo@ipt.pt

(3) Polytechnic Institute of Tomar, Estrada da Serra, Campus da Quinta do Contador, 2300-313 Tomar, Portugal. Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal. Earth and Memory Institute, Largo infant D. Henrique, 6120-750 Mação, Portugal; loost@ipt.pt

Project type: National Seminar

Leader: Teresa Desterro

Coordination: Teresa Desterro, Luiz Oosterbeek, Silvério Figueiredo and Rita Anastácio

Team: Alexandra Figueiredo, Anabela Moreira, António João Cruz, António Ventura, Carla Rego, Carlos Monteiro, Eduardo Ferraz, Fernando A. B. Pereira, Fernando Coimbra, Fernando Costa, Fernando Rocha, Fernando Salvador, Inês Serrano, João Coroado, Jorge Mascarenhas, José Gamelas, Leonor Loureiro, Lídia Catarino, Luís Mota Figueira, Luís Santos, Luiz Oosterbeek, Marco Rocha, Maria João Revez, Maria Teresa Desterro, Miguel C. Moncada, Rita Anastácio, Silvério Figueiredo and Verónica Ribeiro

Instituitions involved: Instituto Politécnico de Tomar, Instituto Terra e Memória, Universidade de Coimbra, Ministério da Cultura.

Goals: To promote a multidisciplinary debate on the themes of archaeology, conservation and restoration, engaging all scholars from IPT dealing with heritage issues, also inviting scholars from closely related research and education institutions.

Results:

- Contributions on Conservation and Restoration of Heritage;
- Contributions on Landscape and Heritage;
- Contributions on Architecture and Urbanism;
- Final round-table on the interaction between humanities, sciences and technology in relation to sustainability.

Poster of the seminar.

General view of the audience in Mação.

Outputs:

Book of abstracts

1. Desterro, T.; Figueiredo, S., (coord.), 2017. *Livro de resumos das I Jornadas da Unidade Departamental de Arqueologia, Conservação e Restauro e Património do Instituto Politécnico de Tomar: Património e Território: investigação, ensino e desenvolvimento*. Tomar: IPT.

I Jornadas do Património Arqueológico das Caldas da Rainha (Caldas da Rainha, 22-23 september, 2017)

Alexandra Figueiredo[1]

(1) Politecnic Institute Tomar, Geosciences Centre of the University of Coimbra, Rua Sílvio Lima, 3030-790 Coimbra, Portugal; alexfiga@ipt.pt

Project type: National Conference

Leader: Alexandra Figueiredo

Coordination: Alexandra Figueiredo, Ricardo Lopes, Cláudio Monteiro

Team: Alexandra Figueiredo, Ricardo Lopes

Institutions involved: Instituto Politécnico de Tomar, CAA Portugal, Município das Caldas da Rainha, Associação NOSTRUM, Museu do Hospital Termal e das Caldas and Museu de Cerâmica

Goals: To promote a multidisciplinary debate on themes such as archaeology, history e nature.

Create awareness to the preservation of the historical, archaeological and natural heritage.

Results: Twelve papers presented.

Discussions after every panel about the themes presented.

Guided visits to heritage monuments of the city

Public watching the sessions

One of lectures presented at the meeting

Guided tour to the city park

LQTT - Quaternary, Technology and Taphonomy Laboratory

LQTT - Laboratório de Quaternário, Tecnologia e Tafonomia

Nelson J. Almeida[1,2], Davide Delfino[1], Cristiana Ferreira[1], Pedro Cura[1,3] and Sara Cura[1,3]

(1) Geosciences Centre of the University of Coimbra, ITM – Earth and Memory Institute, Largo dos Combatentes 6120-725, Mação; (2) Polytechnic Institute of Tomar, Estrada da Serra, Campus da Quinta do Contador, 2300-313 Tomar, Portugal;(3) Prehistoric Art Museum, Largo dos Combatentes 6120-750, Mação; nelsonjalmeida@gmail.com

Project type: Research and Innovation

Leader: Nelson J. Almeida

Coordination: Nelson J. Almeida

Team: Nelson J. Almeida, João Belo, Luís Costa, Davide Delfino, Cristiana Ferreira, Pedro Cura and Sara Cura

Institutions involved: Earth and Memory Institute (ITM); Polytechnic Institute of Tomar (IPT); Geosciences Center of the University of Coimbra (CGeo – UC).

Goals:

The LQTT is dedicated to studies of i) fluvial terraces and quaternary formations chronostratigraphy, ii) technology and tipology of lithics, ceramics and metals, and iii) analysis of transformation and fossilization processes of organic vestiges in archaeological contexts.

Besides laboratory analysis, the LQTT team is involved on several ongoing projects comprising fieldwork (field surveys and archaeological excavations).

Having been created recently, the laboratory outputs are on-going; still it inherits the experience of its team.

Examples of archaeological materials studied in the scope of the LQTT laboratory.

Outputs:

Articles

1. Almeida, N. J.; Scarre, C.; Cerrillo Cuenca, E.; Borralheiro, A.; Belo, J.; Costa, L.; Cura, P.; Ferreira, C.; Garcês, S.; Neves, C.; Oosterbeek, L., 2017. Novos trabalhos arqueológicos no Médio Tejo: o projecto "Tarefas em movimento através das formas: a dispersão agro-pastoril para e a partir do Alto Ribatejo". *Online Al-Madan (submitted).*

2. Delfino, D. 2017 Copper and bronzes: the complete recycling born in Bronze Age, In Gheorghiu, D.; Mason, P. (eds.), *Working with the past:Strategies for crisis or intentional incorporation? Towards an archaeology of recycling*, Oxford: Archaeopress, pp. 49-62 ISBN 9781784916299

3. Cura, S.; Cura, S., 2017. Tecnologia e matéria-prima no Plistocénico Médio do baixo vale do Tejo: o exemplo do sítio da Ribeira da Ponte da Pedra. *Revista Portuguesa de Arqueologia.* Vol. 20, pp. 19-29.

LAEM - Archaeobotany and Ecology Laboratory of Mação

LAEM - Laboratório de Arqueobotânica e Ecologia de Mação

Cristiana Ferreira[1]

(1) Geosciences Centre of the University of Coimbra, ITM – Earth and Memory Institute, Largo dos Combatentes 6120-725, Mação; Ferreira.cris.00@gmail.com

Project type: Research and Innovation

Leaders: Cristiana Ferreira

Coordination: Cristiana Ferreira; Pierluigi Rosina; Luiz Oosterbeek

Team:

Scientific-Strategic Orientation team:

António Louro (Vice- President, Câmara Municipal de Mação); Fernando Monteiro (President MELBANDOS – Cooperativa de Apicultores do Concelho de Mação); José Almeida (Director, Agrupamento Escolas Verde Horizonte, Mação); Luís Santos (Instituto Politécnico de Tomar; ITM); Luiz Oosterbeek (Instituto Politécnico de Tomar; ITM); Pierluigi Rosina (Instituto Politécnico de Tomar; ITM); Ana Paula Machado (Unidade Laboratorial Central do Instituto Politécnico de Tomar).

Scientific Team:

Cristiana Ferreira; Luís Santos (Escola Superior de Tecnologia de Tomar, Instituto Politécnico de Tomar); Luísa Gonçalves (Agrupamento de Escolas Verde Horizonte, Mação).

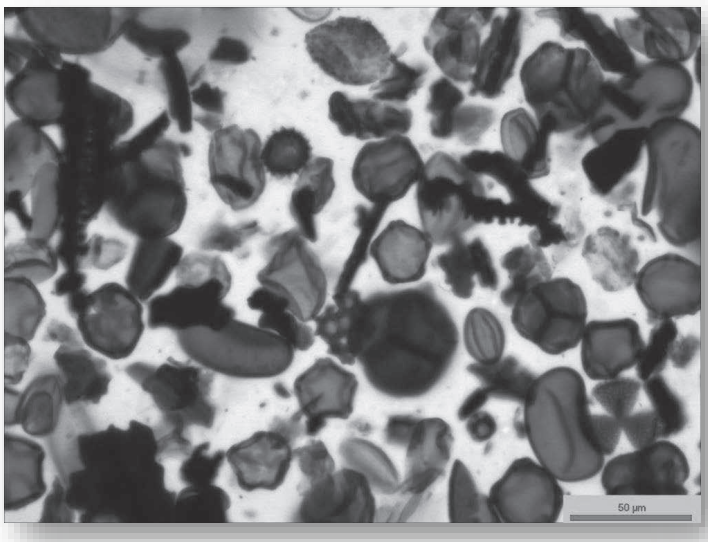
Technical team:

Vasco Pires (Agrupamento de Escolas Verde Horizonte, Mação); Pedro Marques (MELBANDOS); Maria Isabel Silva (Unidade Laboratorial Central do Instituto Politécnico de Tomar)

Instituitions involved: Earth and Memory Institute (ITM); Polytechnic Institute of Tomar (IPT); Geosciences Center of the University of Coimbra; Agrupamento de Escolas Verde Horizonte; MELBANDOS – Cooperativa de Apicultores do Concelho de Mação; AMARMAÇÃO – Associação de Desenvolvimento do Concelho de Mação; Cátedra UNESCO de Humanidades e Gestão Integrada do Território.

Goals:

Paleoenvironmental reconstitution and quaternary climate change research; development of scientific dissemination activities in the school environment; development of activities related to the analysis and certification of honey; socialization of research; dissemination and validation of knowledge in specialized forums.



Sample overview of the palynological study of Vale de Cavalos, Chamusca.

Outputs:

Communications

1. Ferreira, C., Almeida, N., Burjachs, F., Rosina, P., Oosterbeek, L., 2017. Environmental and climate changes during Little Ice Age in Central Portugal. International Meeting Histories of Nature and Environments: perspectives and dialogues. University of Lisbon and NOVA University of Lisbon. FLUL, Lisbon, 15-17 March, 2017.

2. Ferreira, C., Di Mascio, M., Gialanella, S., 2017. Análise e interpretação de microcarvões de dois contextos históricos do Alto Ribatejo: Paúl do Boquilobo e Alvega (Centro de Portugal). XII Jornadas Ibero-Americanas de Arqueologia e Património. Museu de Arte Pré-Histórica e do Sagrado no Vale do Tejo, Mação. 27 e 28 de Março, 2017.

LAE - Experimental Archaeology Laboratory

LAE - Laboratório de Arqueologia Experimental

Pedro Cura[1,2], Sara Cura[1,2] and Sara Garcês[1]

(1) Geosciences Centre of the University of Coimbra, ITM – Earth and Memory Institute, Largo dos Combatentes 6120-725, Mação; (2) Polytechnic Institute of Tomar, Estrada da Serra, Campus da Quinta do Contador, 2300-313 Tomar, Portugal; (3) Prehistoric Art Museum, Largo dos Combatentes 6120-750, Mação; 0pedrocura@gmail.com

Project type: Research and Innovation

Leader: Pedro Cura

Coordination: Pedro Cura

Team: Pedro Cura, Sara Cura, Sara Garcês

Institutions involved: Earth and Memory Institute (ITM); Polytechnic Institute of Tomar (IPT); Geosciences Center of the University of Coimbra (CGeo – UC); Museum of Prehistoric Art of Mação (MAP)

Goals:

The LAE is a laboratory specialized in experimental archaeology activities, namely lithics, ceramics and rock art technology. It complements ongoing research projects, both individual and institutional. Altough its main geographical area of actities is the Tagus Valley, it participates in a wider scenario, including several European and South American countries.

Besides its research focus, the LAE also has the socialization of scientific knowledge as a major guideline, specially to children.

Examples of experimental archaeology activities developed by the LAE.

Outputs:

Articles

1. Cura, S.; Cura, S., 2017. Tecnologia e matéria-prima no Plistocénico Médio do baixo vale do Tejo: o exemplo do sítio da Ribeira da Ponte da Pedra. *Revista Portuguesa de Arqueologia.* Vol. 20, pp. 19-29.

2. Aldeias, V.; Gur-Arieh, S., Maria, R., Monteiro, P., Cura, P., 2016. *Shell* we cook it? An experimental approach to the microarchaeological record of shellfish roasting. Archaeological and Anthropological Science. Pp 1-19.

LAR - Rock Art Laboratory

LAR - Laboratório de Arte Rupestre

Sara Garcês[1] and Luiz Oosterbeek[1]

(1) Geosciences Centre of the University of Coimbra, ITM – Earth and Memory Institute, Largo dos Combatentes 6120-725, Mação; saragarces.rockart@gmail.com, loost@ipt.pt

Project type: Research and Innovation

Leaders: Sara Garcês and Luiz Oosterbeek

Coordination: Sara Garcês and Luiz Oosterbeek

Team: Other members of CGEO and research students

Instituitions involved: Museu de Arte Pré-Histórica e do Sagrado do vale do Tejo; Instituto Terra e Memória, Portugal.

Goals:

The integration of students in scientific research activities and dissemination of their results, as well as the follow-up and constant orientation of students whose master's or doctoral theses are part of research in Rock Art.

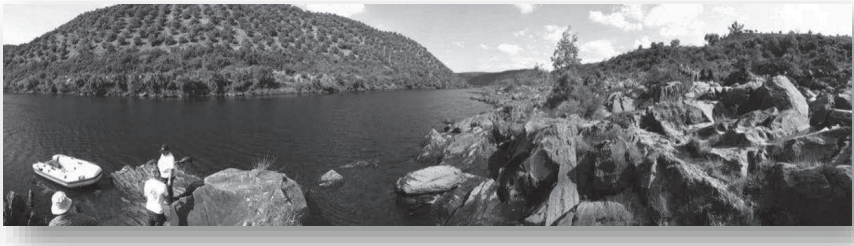
The organization of corpus of rock motifs of the Tagus Valley Rock Art Complex and other landscape archeology projects developed by the Polytechnic Institute of Tomar and its institutional partners.

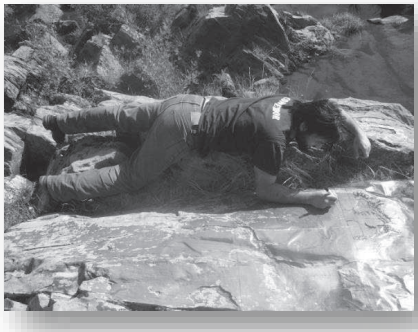
Results:

To establish the framework of geographic dispersal of the graphic complex in the territory. To this end, systematic surveys will be carried out not only in the valley (in areas not previously covered by previous projects, but in particular) in its tributaries of both banks, in areas not affected or partially affected by the reservoirs (eg Ocreza, Zêzere, etc.), and also including the quartzite crests that offer conditions for the preservation of paintings.

To recover and analyze the documentation relating to currently submerged Tejo pictures, to make restitutions from the molds that are accessible to us, and to make molds on panels affected by the risk of degradation (by submersion or other agents, such as systematic monitoring of rock Ocreza valley has allowed to register), using non-invasive documentation methodologies (according to the principles agreed in IFRAO and UISPP). The objective is not only to reproduce in real scale the representations, but also to determine the graphic stratigraphies (analysis of the overlapping) and the use of the graphic space, the study of the composition and the execution processes (operative chains), the analysis of the distribution of the sites in the areas and of the possible relations with other

graphic manifestations and with the population (using GIS).



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INSTITUTO TERRA E MEMÓRIA

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COMPETE
PROGRAMA OPERACIONAL FACTORES DE COMPETITIVIDADE

QREN
QUADRO
DE REFERÊNCIA
ESTRATÉGICO
NACIONAL
PORTUGAL 2007.2013

UNIÃO EUROPEIA
Fundo Europeu
de Desenvolvimento Regional


FCT
Fundação para a Ciência e a Tecnologia