

Ossa Morena and beyond: a tribute to Teodoro Palacios

Abstract Book



International Meeting
University of Extremadura
Badajoz, Spain
26th & 27th January 2022



Ossa Morena and beyond: a tribute to Teodoro Palacios

A meeting held as a tribute to Teodoro Palacios on his retirement as
Professor of Palaeontology at the University of Extremadura, Badajoz,
Spain

26th & 27th January, 2022
University of Extremadura, Badajoz

Abstract Book
Edited by Sören Jensen

Organizing Committee:
Sören Jensen
Monica Marti Mus
Iván Cortijo

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Cover photo: Teodoro Palacios in his element, sampling for organic-walled microfossils in the
Cambrian Chapel Island Fm., Newfoundland, Canada

Attendees

| | |
|----------------------------|---|
| Álvaro, J. Javier | Universidad Complutense, Madrid, ES |
| Apalategui, Octavio | Córdoba, ES |
| Arenas, Ricardo | Universidad Complutense, Madrid, ES |
| Barrera, José María | Geoparque Mundial de la UNESCO Villuercas-Ibores-Jara, ES |
| Casquet Martín, César | Universidad Complutense, Madrid, ES |
| Cortijo, Iván | Geoparque Mundial de la UNESCO Villuercas-Ibores-Jara, ES |
| Corrales, José María | Universidad de Extremadura, Badajoz, ES |
| Crispim, Lourenço | Universidade de Lisboa, PT |
| Dias, Rui | Universidade de Évora, PT |
| Dias da Silva, Icaro | Universidade de Lisboa, PT |
| Díez Fernández, Rubén | Instituto Geológico y Minero de España, Madrid, ES |
| Eguiluz, Luis | Universidad del País Vasco, ES |
| Esteve, Jorge | Universidad Complutense, Madrid, ES |
| Fuenlabrada, José Manuel | Universidad Complutense, Madrid, ES |
| Gozalo, Rodolfo | Universitat de València, ES |
| Jensen, Sören | Universidad de Extremadura, Badajoz |
| Liñán, Eladio | Universidad de Zaragoza, ES |
| Machado, Gil (virtual) | Chronosurveys Lda, Almada, PT |
| Marti Mus, Monica | Universidad de Extremadura, Badajoz, ES |
| Moreira, Noel | Universidade de Évora, PT |
| Moreno-Martín, Diana | Universidad Complutense, Madrid, ES |
| Neto de Carvalho, Carlos | UNESCO Naturtejo Global Geopark, PT |
| Novo-Fernández, Irene | Universidad Complutense, Madrid, ES |
| Palacios, Teodoro | Universidad de Extremadura, Badajoz, ES |
| Quesada, Cecilio (virtual) | Instituto Geológico y Minero de España, Madrid, ES |
| Rojo-Pérez, Esther | Universidad Complutense, Madrid, ES |
| Sánchez Martínez, Sonia | Universidad Complutense, Madrid, ES |
| Silva, Marcelo G. | Universidade de Évora, PT |
| Silvério, Gonçalo G. | Universidade de Évora, PT |
| Simón, Julián (virtual) | IES Peñalba, Moral de Calatrava, ES |

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The Mississippian Toca da Moura-Cabrela Basin (SW Ossa-Morena Zone, Portugal): sedimentation and palaeoenvironments

Gil Machado^{1,2*}, Noel Moreira^{3,4}, Carlos Neto de Carvalho^{2,5}, João Madrinha^{6,7}, Cristiana J.P. Esteves⁸, Jiří Kalvoda⁹, Afonso Theias⁶, João Jorge⁶, Martim Ramos^{6,10}, Bárbara Silva⁶, Diogo Sousa^{6,11}, Inês Caralinda⁶ & Mário Cachão^{2,6}

¹*Chronosurveys Lda, Almada, Portugal*

²*Instituto Dom Luiz, University of Lisbon, Portugal*

³*Instituto de Investigação e Formação Avançada, University of Évora, Portugal*

⁴*Instituto de Ciências da Terra (ICT), Pole of Évora, Portugal*

⁵*Serviço de Geologia do Município de Idanha-a-Nova. Geoparque Naturtejo Mundial da UNESCO, Portugal*

⁶*Departamento de Geologia, Faculty of Sciences, University of Lisbon, Portugal*

⁷*Instituto Superior Técnico, University of Lisbon, Portugal*

⁸*Geology Department, Ghent University, Belgium*

⁹*Department of Geological Sciences, Masaryk University, Czech Republic*

¹⁰*Almina – Minas do Alentejo, Aljustrel, Portugal*

¹¹*Geoárea – Consultores de Geotecnia e Ambiente Lda, Amadora, Portugal*

*gil.machado@chronosurveys.com

Introduction and Geological context

The Iberian Massif is the most southwestern domain of European Variscides, displaying an internal organization that allows to identify several palaeogeographic zones, among which the Ossa-Morena Zone (OMZ) that is included in the hinterland domains of this Massif. The Carboniferous sedimentation in the hinterland is restricted to small basins, controlled by the tectonic setting. During early Mississippian, the transitional subduction-collision process seems to be responsible for the genesis of syn-orogenic basins in the OMZ, such as the Toca da Moura-Cabrela Basin (TMCB) along the southwest boundary of the OMZ. The TMCB is characterized by a volcano-sedimentary complex with a Late Tournaisian-Late Visean age, which is the object of this study.

Sedimentation ages

Samples from several sections of the TMCB were taken, processed for palynology and analysed under transmitted light microscopes. The observed organic particles were invariably dark grey to black, indicative of a very high thermal maturation. From the 4 oxidized samples, only 2 provided recognizable palynomorphs. The two samples derived from carbonate-bearing shale/siltstone outcrops in the northern part of the Cabrela sub-basin, thus far unstudied. One provided a fairly diversified late Tournaisian spore assemblage. The poor preservation frequently hampered the identification to species level, but several stratigraphically relevant taxa were observed. The other productive sample allowed only to determine a general Tournaisian-Visean age. Several thin sections were produced from the 3 samples taken for micropaleontological purposes, from the rare non-remobilized carbonates in the TMCB (interbedded in the turbidite succession). The occurrence of foraminifera, such as the rare *Paraarchaediscus*, *Pojarkovella*, *Hemiarchaediscus? stilus* together with widespread *Uralodiscus* spp. in this association indicates the subzone MFZ11B (mid Visean).

Sedimentology and palaeoenvironments

Along the edges of the Cabrela sub-basin, conglomerate beds outcrop at the bottom of succession. In the northern edge, the conglomerate lithoclasts derived from early Palaeozoic units of the OMZ, currently outcropping to the East and North (and partially to the South) of the basin. Clasts from the South Portuguese Zone are notably absent. In the southern edge, several carbonate clasts are present, frequently dolomitized. The remainder of the sedimentary rocks are dominated by grey to black shales interbedded with siltstones and fine sandstones (rarely coarser-grained), which are interpreted as low-density turbidite deposits. Locally the

coarser-grained intervals are dominated by volcanic-derived clasts. Palaeocurrent study on turbidite deposits from TMCB indicates: (1) the dominance of palaeocurrents to the SW quadrant in the Cabrela sub-basin (northern part); (2) great dispersion in the northern domains of Toca da Moura sub-basin (central area), although with dominance to the western quadrant; and (3) transport to the N quadrant in the southern part. The palynofacies analysis showed varying amounts of organic particle types, with AOM and phytoclasts as dominant types – up to 73% and 89% respectively. Phytoclasts are in most instances black and opaque, of several sizes. Palynomorphs were present in all samples, but always subordinate, up to 11%. These were composed of essentially sporomorphs and extremely rare acritarchs. The TMCB samples plot in fields I, VI, VII and IX of the Tyson diagram, with a greater prevalence in fields corresponding to suboxic to anoxic settings (shelf to basin).

Ichnology and ecological traits

Bioturbation was found in simple tiering profiles in three of the studied sections, namely Corte Pereiro, Monte Novo and “Buraco”. In Corte Pereiro, the upper 9 m of the succession show thin-bedded turbidites composed mainly by Td-Te Bouma intervals, dominated by dark pelites with rare, cm-thick intercalations of fine-to-very fine sandstones and siltstones with convolute, oblique and parallel lamination, sole marks including flute casts and, occasionally, hypichnial bioturbation. Slumps are also visible at the outcrop-to-bedding scales. Bioturbational tiering is condensed and divided in post- and pre-depositional suites: horizontal, slightly curving, unlined, evenly-sized meniscate burrows (*Taenidium satanassi*), sub-horizontal to oblique winding, lined burrows (*Palaeophycus* isp.) and the millimetric sub-horizontal winding burrow with levees *Helminthoidichnites* isp. (post-depositional); rare wide spiral, single-whorled *Spirodesmos archimedeus* and the irregular burrow network *Megagraption irregulare* graphoglyptids, besides bowl-shaped vertical burrows of *Bergaueria* isp. (pre-depositional). Both tiers are intersected by 3D tunnel branching systems (*Chondrites* isp.) extending downwards to the organic-rich shales and filled by pyrite.

Diversity of behaviours in deep sea deposits reached a relative maximum by the Mississippian. This is not the case in the TMCB. Diluted turbidite events in a succession otherwise dominated by black shales, showing simple shallow tiers and low ichnodiversity, with the presence of opportunistic bioturbation events dominated by simple, mobile deposit-feeding strategies and the rare presence of pre-depositional graphoglyptid-bearing suites and the deeper activity of a non-vagile organism below the redox boundary, reveal a hostile, unstable, quickly oxygen-depleting environment with high sedimentation rates. Turbidites were responsible for the short-term colonization windows, episodically increasing in oxygen the bottom and interstitial waters of these organic-resourceful substrates, but where oxygen-depletion was faster than the bioturbation rate during the quiescent deposition. Moreover, the post-depositional suite is dominated by only three facies crossing, simple deposit-feeding ethologies in low ichnofabric indices, indicative of a low-energy slope environment and being closer to shelfal expressions of the *Zoophycos* Ichnofacies.

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