

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

Meeting made possible thanks to sponsorship from University of Extremadura

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

Table of Contents

Álvaro, J.J. The Ediacaran-Cambrian boundary in Iberia—an historical approach	1
Arenas R, Díez Fernández R, Rojo-Pérez E, Novo-Fernández I, Fuenlabrada JM, Albert R, Sánchez Martínez S, Andonaegui P & García-Casco A. Cadomian ophiolites in the Ossa-Morena Complex: where and why	3
Barrera JM. El Comité Educativo y Científico en el Geoparque Mundial de la UNESCO Villuercas-Ibores-Jara	5
Cortijo I, Barrera JM, Martí Mus M & Jensen S. Cloudina in the Villuercas-Ibores-Jara UNESCO Global Geopark, Spain: from science to society	7
Crispim L, Chichorro M, Bento dos Santos T, Linnemann U, Hofmann M & Neto de Carvalho C. U-Pb zircon geochronology of metasedimentary and igneous rocks from Penha Garcia-Salvaterra do Extremo sector, Central Iberian Zone	9
Díez Fernández R, Arenas R, Novo-Fernández I, Rojo-Pérez E, Sánchez Martínez S, Fuenlabrada JM, Albert R, Rubio Pascual FJ, Martín-Parra LM, García-Casco A, Matas J & Andonaegui P. Cadomian and Variscan sutures of Iberia: a comparison	11
Eguíluz L & Sarrionandía F. Reinterpretación de los las líneas sísmicas IBERSEIS (sector de la Zona de Ossa-Morena) y ALCUDIA, a la luz de la Nueva Cartografía Geológica de Extremadura (Palacios et al. 2013)	13
Esteve J, Suárez MG, Marcé-Nogué J & Álvaro JJ. Functional diversity constraints in early trilobite evolution	15
Fuenlabrada FM, Arenas R, Díez Fernández R, Rojo-Pérez E, González del Tánago J, Martín-Parra LM, Matas J, Sánchez Martínez S, Andonaegui P & Solís Alulima B. A new update on the Cadomian paleoreconstruction of the Iberian Gondwana margin: the Sierra Albarrana metasedimentary group	17
Gámez Vintaned JA, Aguilar de Dios JE, Dies ME, Mayoral E & Liñán E. La Mezquita-Catedral de Córdoba, una grandiosa exposición paleontológica: icnofósiles	19
Jensen S. First record of sandstone mounds from the Ordovician Armorican Quartzite Formation of southwest Spain	21
Liñán E, Gozalo R, Collantes L & Mayoral E. Trilobite biostratigraphy of the Marianian (Cambrian Series 2) from Sierra Norte de Sevilla: an overview	23
Machado G, Moreira N, Neto de Carvalho C, Madrinha J, Esteves CJP, Kalvoda J, Theias A, Jorge J, Ramos M, Silva B, Sousa D, Caralinda I & Cachão M. The Mississippian Toca da Moura-Cabrela Basin (SW Ossa-Morena Zone, Portugal): sedimentation and palaeoenvironments	25

Moreira N, Araújo A, Pedro J & Roseiro J. Tectono-stratigraphic architecture of parautochthonous and allochthonous successions of Viana-Alvito region (SW of Ossa-Morena Zone)	27
Moreno-Martín D & Díez Fernández R. Influence of the Ediacaran–Cambrian record on the Late Paleozoic tectonics of the Central Iberian Zone	29
Neto de Carvalho C, Muñiz F, Baucon A, Bayet-Goll A, Pereira S, Dias da Silva I, Colmenar J, Pires M & Young T. Ichnology in the onset of the Hirnantian glaciation: the Rio Ceira Group of the Penha Garcia Syncline (Portugal)	31
Pereira S, Dias da Silva I, Colmenar J, Pires M, Young T & Neto de Carvalho C. The Penha Garcia Syncline in the Naturtejo Geopark (Portugal): mapping the intricate Ordovician palaeogeography in the Variscan fold chain	33
Quesada C. Cambrian through Ordovician evolution of the Ossa Morena Zone: from subduction-through rifting-to drift on the outer, southern passive margin of the Rheic Ocean	35
Rojo-Pérez E, Fuenlabrada JM, Arenas R, Díez Fernández R, Sánchez Martínez S, Martín-Parra LM, Matas J & Andonaegui P. The SW Iberian Serie Negra Group (Ossa-Morena Complex, Variscan Orogen): a key element in the dynamic evolution of the peri-Gondwanan arc-related basins	37
Sánchez Martínez S, Arenas R, Díez Fernández R, Gerdes A, Albert R, Novo-Fernández I, Rojo-Pérez E, Andonaegui P & Fuenlabrada JM. Geochemistry of Devonian ophiolites from NW Iberian Massif: the record of an evolving ephemeral oceanic basin	39
Silva MG, Nogueira P, Henriques R & Gonçalves MA. Remote sensing in Ossa-Morena Zone: lithological and mineralogical mapping using satellite and multispectral drone imagery	41
Silvério GG, Liao JC, Valenzuela-Ríos JI, Machado G, Moreira N & Barreto P. Biostratigraphy of the Eifelian (Middle Devonian) Pedreira da Engenharia Formation, SW Ossa-Morena Zone	43
Simón J. Nuevos fósiles en y bajo la megabrecha de Navalpino, Zona Centroibérica, España	45

Tectono-stratigraphic architecture of parautochthonous and allochthonous successions of Viana-Alvito region (SW of Ossa-Morena Zone)

Noel Moreira^{1,2*}, Alexandre Araújo^{1,3}, Jorge Pedro^{1,3} & José Roseiro^{1,3}

¹*Instituto de Ciências da Terra, Pole of Évora, Portugal*

²*Instituto de Investigação e Formação Avançada, University of Évora, Portugal*

³*Departamento de Geociências, University of Évora, Portugal*

*nafm@uevora.pt

Introduction and geodynamic context

The Variscan Cycle in SW Iberia is controlled by the evolution of Rheic and other small Palaeozoic oceanic basins (Ribeiro et al. 2010). During Cambrian times, the rifting stage of northern Gondwana begins (Sánchez-García et al. 2019), generating in the southernmost domains of the Iberian Terrane, i.e. Ossa Morena Zone (OMZ), a particular stratigraphic succession. The early Cambrian stratigraphy is characterized by an extensive carbonated platform deposited over a basal lenticular conglomerate associated with felsic volcanic rocks, which overlies the contact with previously deformed Neoproterozoic succession (Cadomian Cycle). Above the carbonate succession, a rift-related detrital Cambrian succession is developed. The extensional tectonics promote lithosphere thinning and the emplacement of numerous bimodal igneous suites during Cambrian rifting stage, showing discriminant geochemical features along the process time-span (Sánchez-García et al. 2019). These igneous suites are either interbedded within Cambrian stratigraphic successions or generating some plutonic or sub-volcanic bodies.

The stretching of the northern Gondwanan terranes culminated with the opening of the Rheic Ocean during the Cambrian-Ordovician transition (ca. 480 Ma; Pedro et al. 2013; Moreira et al. 2014), and the Ordovician to Lower Devonian stratigraphic succession shows geochemical and stratigraphic passive margin features (Roseiro et al. 2020). During Lower Devonian times, the closure of the Palaeozoic oceans took place and, in the southern boundary of the OMZ, a complex suture zone is developed during subduction-collision processes that persisted until upper Carboniferous times. Thus, the southernmost domains of the OMZ consists in a complex structure resulting of thrusting of allochthonous and parautochthonous complexes into the inner sections of the relative autochthonous domain. This works proposes a new tectonostratigraphic arrangement for these complexes, based on data collected on the Viana do Alentejo-Alvito region.

The Viana-Alvito region: reconstructing the stratigraphic succession

The Viana do Alentejo-Alvito region is characterized by a highly deformed stratigraphic succession, showing distinct metamorphic regimes. Although the tectono-metamorphic imprint mask most of the stratigraphic characteristics of this succession, it is possible to recognize several lithological features that allows to reconstruct the original stratigraphic Neoproterozoic-Cambrian succession (Oliveira et al. 1991). From the bottom to the top: (1) a siliciclastic succession composed of shale-derived micaschists and metagreywackes, with subordinate metabasalts and meta-lydites (Série Negra succession); (2) a volcano-sedimentary complex dominated by felsic volcanic and sub-volcanic rocks; (3) a thick succession of marbles, often with interbedded mafic volcanic rocks; and (4) a bimodal volcano-sedimentary complex, with prevalence of mafic volcanic rocks over the siliciclastic component. Due to the high metamorphic conditions, it is not possible to constrain the biostratigraphic age of these units, and there are no significant geochronological studies in this region aiming to constraint the age of this succession.

General tectono-stratigraphic architecture of the Viana-Alvito region

The structure in this region has a complex and arcuate trend (N–S general trend in the most occidental sectors, tending to a NW–SE main direction in the most oriental ones), being result of poly-phase deformation. The discrepant metamorphic conditions and the structural features, allows to recognize 5 tectono-stratigraphic units. From West to East:

(1) A high temperature unit describing a cartographic scale N–S antiform. On its core a felsic unit was recognized, being composed either by a sub-volcanic (plutonic?) gneiss or by volcanic lithotypes showing a pervasive S-L fabric. At both limbs, it is possible to identify a composite folded structure where it is noticed the Série Negra succession, the marble unit, including high-temperature olivine marbles, and volcano-sedimentary complexes, being possible to well-reconstruct the previous mentioned stratigraphic sequence, being considered an autochthonous sequence.

(2) The follow tectono-stratigraphic unit is an imbricate complex, mostly composed of Série Negra derived micaschists with abundant mafic and felsic volcanic rocks. Mafic volcanic rocks express high pressure (HP) metamorphic paragenesis (Pedro et al. 2013).

(3) Above, another imbricated tectono-stratigraphic unit, here mainly composed of Cambrian-like successions, including volcano-sedimentary and marble units. Also in this unit, the mafic volcanic rocks, even the ones within the Cambrian marble unit, show HP metamorphism paragenesis (Rosas et al. 2008, Pedro et al. 2013).

(4) A unit composed of mafic rocks at greenschist facies rests above the HP units. It is not clear the nature of this unit, however, in three sector (Vila Ruiva, Oriola and Antas), an internal ophiolite architecture was identified (Pedro et al. 2013).

(5) At the top of these tectono-stratigraphic units rests the Cubito-Moura Phyllonitic Complex, an imbricated complex mainly composed of highly deformed phyllonites, often with felsic and mafic volcanic rocks in greenschist metamorphic facies (Araújo et al. 2005). This unit include lenses of Silurian black schists and lydites with graptolites.

All these tectono-stratigraphic units are detached by first order tangential shear zones.

Acknowledgments. This work is a contribution to the project “ZOM-3D Metallogenic Modelling of Ossa-Morena Zone” (ALT20-03-0145- FEDER-000028), funded by Alentejo 2020 through the FEDER/FSE/FEEL. This work is supported by national funds through FCT - Fundação para a Ciência e a Tecnologia, I.P., under the project Ref. UIDB/04683/2020.

References

- Araújo A, Fonseca ., Munhá J, Moita P, Pedro J, Ribeiro A. 2005. The Moura Phyllonitic Complex: an accretionary complex related with obduction in the Southern Iberia Variscan Suture. *Geodinamica Acta* 18, 375–88.
- Moreira N, Araújo A, Pedro J, Dias R. 2014. Evolução Geodinâmica na Zona de Ossa- Morena no contexto do SW Ibérico durante o Ciclo Varisco. *Comunicações Geológicas*, 101(special volume 1), 275–8.
- Oliveira, JT, Oliveira V, Piçarra JM. 1991. Traços gerais da evolução tectono-estratigráfica da Zona de Ossa-Morena. *Cuadernos do Laboratorio Xeoloxico de Laxe* 16, 221–50.
- Pedro J, Araújo A, Fonseca P, Munhá J, Ribeiro A, Mateus A. 2013. Cinturas ofiolíticas e metamorfismo de alta pressão no bordo SW da Zona de Ossa-Morena. In: *Geologia de Portugal*, vol. 1 (eds R Dias, A Araújo, P Terrinha, JC Kullberg), pp. 647–71. Escolar Editora.
- Ribeiro A, Munhá J, Fonseca PE, Araújo A, Pedro J, Mateus A, Tassinari C, Machado G, Jesus A. 2010. Variscan ophiolite belts in the Ossa-Morena Zone (Southwest Iberia): geological characterization and geodynamic significance. *Gondwana Research* 17, 408–21.
- Rosas FM, Marques FO, Balleve M, Tassinari C. 2008. Geodynamic evolution of the SW Variscides: orogenic collapse shown by new tectonometamorphic and isotopic data from western Ossa-Morena Zone, SW Iberia. *Tectonics* 27, TC6008.
- Roseiro J, Moreira N, Nogueira P, Maia M, Araújo A, Pedro J. 2020. Depositional environment and passive-to-active margin transition as recorded by trace elements chemistry of lower-middle Palaeozoic detrital units from the Ossa-Morena Zone (SW Iberia), *Comunicações Geológicas*, 107 (special volume II), 39–46.
- Sánchez-García T, Chichorro M, Solá AR, Álvaro JJ, Díez-Montes A, Bellido F, Ribeiro ML, Quesada C, Lopes JC, Dias da Silva Í, González-Clavijo E, Gómez Barreiro J, López-Carmona A. 2019. The Cambrian-Early Ordovician Rift Stage in the Gondwanan Units of the Iberian Massif. In: *The Geology of Iberia: a geodynamic approach*. Vol.2: The Variscan Cycle (eds C Quesada, JT Oliveira), pp. 27–74. Springer, Berlin.
