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Review Article

The palynology of the Upper Triassic-Lower Jurassic in the Algarve and Lusitanian basins, Portugal

Margarida Vilas-Boas [a,*], Simonetta Cirilli [a], Zélia Pereira [b], Luís Vítor Duarte [c], Paulo Fernandes [d]

[a] Dipartimento di Fisica e Geologia, Università degli Studi di Perugia, 06123 Perugia, Italy
[b] LNEG, Laboratório Nacional de Energia e Geologia (Geological Survey), Rua da Amieira, 4465-965 S. Mamede de Infesta, Portugal
[c] University of Coimbra, Earth Sciences Department, and Marine and Environmental Sciences Centre (MARE)/ARNET, 3030-790 Coimbra, Portugal
[d] CIMA, Centre of Marine and Environmental Research\ARNET - Infrastructure Network in Aquatic Research, University of Algarve, Campus de Gambelas, 8000-139 Faro, Portugal

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ABSTRACT

High-resolution palynological analyses from the Algarve and Lusitanian basins (Portugal) provide a refined biostratigraphical framework and palaeoenvironmental reconstruction for the Late Triassic–Early Jurassic transition. In the Algarve Basin, three new palynozones (AT, SC, and CP) characterise the Silves Group from the early Carnian to early Hettangian, documenting the first Iberian occurrence of *Tulesporites briscoensis* and precisely delineating the Triassic–Jurassic Boundary (TJB). In the Lusitanian Basin, three palynozones (CG, IK, and Pm) constrain the Conraria and Pereiros formations to the Norian–Hettangian, with the TJB located at the base of the Pereiros Formation. Palaeoenvironmental reconstructions reveal distinct basin-specific evolutions. The Algarve Basin records an early transition from fluvial (Silves Sandstones) to marginal-marine (lagoonal and pond) settings, evidenced by abundant upper Carnian algal elements and reworked Neoproterozoic algae. Conversely, the Lusitanian Basin reflects a Norian-Hettangian marginal-marine, river-dominated setting, with microforaminiferal linings at the base of the Pereiros Formation marking the earliest marine transgression in the Lusitanian Basin. Quantitatively, both basins show a persistent dominance of xerophytic taxa, indicating a shift toward warmer, seasonally dry conditions across the TJB. Malformed sporomorphs in both records suggest environmental stress potentially linked to Central Atlantic Magmatic Province (CAMP) activity. Comparative analysis reveals that sedimentation initiated earlier in the Algarve (early Carnian) than in the Lusitanian Basin (Norian), suggesting diachronous development during Pangaea breakup. The assemblages show strong affinities with the Onslow Microflora, highlighting the Portuguese margin as a key archive for western Tethyan floral and climatic evolution.

1. Introduction

The Triassic-Jurassic Boundary (TJB; 201.4 ± 0.2 Ma; Gradstein and Ogg, 2020) marks one of the most critical intervals in Earth's history, characterized by profound tectonic, climatic and biotic changes. This transition is associated with: (1) the beginning of the Pangaea breakup (Müller et al., 2016); (2) widespread deposition of huge evaporites across continental platforms (e.g. Iberian Peninsula, North of Africa (Buratti and Cirilli, 2007)); (3) a globally warm climate, with the Late Triassic and Early Jurassic considered among the warmest intervals in the Phanerozoic (Vaughan, 2007); (4) deposition of red beds (Cirilli, 2010) and, (5) absence of glacial deposits even at the high palaeolatitudes (Hochuli and Vigran, 2010). This time interval also coincides with the end-Triassic Mass Extinction (ETME), one of the most severe biotic crises recognised in the Phanerozoic (Raup and Sepkoski, 1982; Sepkoski, 1996; Marzoli et al., 2004; Tanner et al., 2004; Nomade et al., 2007; Davies et al., 2017).

This event triggered substantial ecological turnover in both marine and terrestrial realms, with notable extinctions among marine taxa and significant changes in continental flora and fauna (Guex et al., 2004;

* Corresponding author at: Dipartimento di Fisica e Geologia, Università degli Studi di Perugia, 06123 Perugia, Italy.
E-mail addresses: margarida.vboas@gmail.com (M. Vilas-Boas), simonetta.cirilli@unipg.it (S. Cirilli), zelia.pereira@lneg.pt (Z. Pereira), lduarte@dct.uc.pt (L.V. Duarte), pfernandes@ualg.pt (P. Fernandes).

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