



Prasinophyte bloom and putative fungi abundance near the Kačák event (Middle Devonian) from the Odivelas Limestone, Southwest Iberia

Gil Machado^{1,2} · Ladislav Slavík³ · Noel Moreira⁴ · Paulo Emanuel Fonseca^{2,5}

Received: 6 February 2019 / Revised: 7 September 2019 / Accepted: 12 December 2019

© Senckenberg Gesellschaft für Naturforschung and Springer-Verlag GmbH Germany, part of Springer Nature 2020

Abstract

The Kačák Event is one of the several prominent Devonian climatic and biotic perturbations with a supra-regional to global extent. Its record can be traced in the litho- and biostratigraphy of uppermost Eifelian-lowermost Givetian strata and with multiple geochemical and geophysical proxies. In southwest Iberia, within southwestern Ossa-Morena Zone domains, there are rare, scattered Early-Middle Devonian limestone occurrences. One of these occurrences—the Odivelas Limestone type locality—is revisited in terms of conodont biostratigraphy and palynology and the results compared with previous data on reef macrofauna and magnetic susceptibility stratigraphy. The new data show that this locality is probably within the *Polygnathus hemiansatus* zone, i.e. of the earliest Givetian age. The palynological content of a ca. 2 m of black, organic-rich, fine grained limestone section is dominated, in varied proportions, by amorphous organic matter, putative fungal hyphae, and prasinophycean algae. The results are interpreted as an indication of high organic productivity and deposition in hypoxic to anoxic settings and probable biotic crisis, in both marine and terrestrial realms, connected with the Middle Devonian Kačák Event. The similarity of this record with other Devonian events is discussed.

Keywords Ossa-Morena Zone · Eifelian-Givetian · Palynology · Conodonts · Biotic crisis

Introduction

The Devonian was a period with pronounced perturbations both in marine and terrestrial environments and was characterised by several time intervals of global green-house climate, presence of immense epicontinental seas, and several abrupt environmental changes associated to major biological

collapses (Racki 2005; Becker and Kirchgasser 2007; Becker et al. 2012, 2016). Marine realms are characterised by intervals of extensive reef development. The major environmental instabilities in the Devonian are well expressed, especially by the obvious differences between the classical megasequences that represent traditional Hercynian (Bohemian) stages in the Early Devonian and the Middle Devonian stages. These megasequences may reflect the global or, at least, supra-regional trends in environmental dynamics, and, as they can be very distinctly recognised, may also partly correspond to the “Time Specific Facies” (Walliser 1984; Brett et al. 2012; Ferretti et al. 2012). Among the several Devonian prominent sea-level fluctuations, some can be traced globally, e.g. the Basal Pragian and Kačák Events (Chlupáč and Kukul 1986, 1988). In this context, the latest Eifelian Kačák Event has been recognised to have a global (or nearly so) extent (Budil 1995; House 1996, 2002; Walliser 1996; Marshall et al. 2007). A general feature of many traditional bioevents is their connection with significant facies shifts. They can be also well correlated independently, using biostratigraphic tools, stable isotopes, magnetic susceptibility (MS), and other geochemical and geophysical proxies (e.g. Joachimski et al. 2009—isotope

✉ Gil Machado
gil.machado@chronosurveys.com

¹ Chronosurveys Lda, Almada, Portugal

² Instituto Dom Luiz, Faculdade de Ciências da Universidade de Lisboa, Lisbon, Portugal

³ The Czech Academy of Sciences, Institute of Geology, Prague, Czech Republic

⁴ Instituto de Ciências da Terra, Pole of Évora, Escola de Ciência e Tecnologia da Universidade de Évora, Évora, Portugal

⁵ Departamento de Geologia Faculdade de Ciências da Universidade de Lisboa, Lisbon, Portugal