XVIII Congreso Peruano de Geología

Response of western South American epeiric-neritic ecosystem to the mid-Cretaceous OAEs

Juan Pablo Navarro Ramirez[1], Stephane Bodin[2], Lorenzo Consorti[3], y Adrian Immenhauser[1]

[1] Ruhr-Universität Bochum, Institut für Geologie, Mineralogie und Geophysik, D-44870 Bochum, Germany (juan.navarroramirez@rub.de)
[2]Aarhus University, Department of Geoscience, Høegh-Guldbergs Gade 2, 8000 Aarhus C, Denmark
[3] Departament de Geologia (Paleontologia), Universitat Autònoma de Barcelona, 08193 Bellaterra, Spain

Abstract

Introducción introducción introducción introducción introducción introducción introducción introducción introducción introducción. The Albian–Turonian interval (ca 113–90 Ma; mid-Cretaceous) is characterized by series of global environmental perturbations referred to as "oceanic anoxic events" (OAEs). OAEs are represented by an expanded and intensified oxygen minimum zone in the world oceans and coincide well with periods of disturbed carbon cycle. OAEs are often related to enhanced accumulation of black shale in deeper and basinal settings, anomalously high burial rates of marine organic carbon, sea-level fluctuations and changes in trophic levels. A linkage between massive volcanism and OAEs has been suggested. To date, much of the present knowledge of oceanic anoxia in the mid-Cretaceous world is biased towards data derived from hemipelagic and pelagic sections in Europe (Tethys), North America (Western Interior Seaway) and data from various ocean drilling projects. Less attention has been paid to the impact of mid-Cretaceous oceanic anoxic events to shallow water carbonate systems, and the sub-equatorial eastern Pacific domain is particularly underrepresented. In this work we argue that the Cretaceous epeiric depositional environments in western South America (here Peru) arguably bear crucial information to understand OAEs causes and consequences.

In order to close this gap, a field-based project has been performed in Peru. This study is based on a multidisciplinary approach making used of a broad, multi-proxy approach (C, and Sr isotopes, sedimentology, sequence stratigraphy etc.). Geochemical and sedimentological analyses were obtained from 1600 section metres of Albian–Turonian sedimentary rocks, logged in a bed-by-bed approach in six sections in the northern and central part of the Andes Mountain in Peru. The results are compared and discussed to coeval findings from the proto-Atlantic and Tethyan realms in order to understand causal linkages among global geological patterns during the mid-Cretaceous greenhouse world.

The Albian–Turonian interval in Peru (western platform) is characterized by the following ecological and environmental patterns: (i) an late Aptian–early Albian major change from siliciclastic-dominated to carbonate sedimentation coinciding with the impact of the Kilian Level (second black shale level of the OAE1b set); (ii) an early Albian incipient platform drowning linked to the impact of the Paquier Level (third black shale level of the OAE1b set); (iii) an early middle Albian major demise of neritic carbonate production that coincides with the Leenhardt Level (last black shale event of the OAE1b set), followed by middle Albian condensed sedimentation that is associated with prominent negative values in δ13Ccarb prior to the onset of OAE1c; (iv) renewed carbonate ramp production during the late Albian associated to the impact of OAE1d; (v) early to late Cenomanian heterozoan ramp recording the pre-OAE2 δ13C excursions, specifically the Mid-Cenomanian Event; (vi) a late Cenomanian interval typified by outer-ramp heterozoan type sedimentation prior to the δ13C-trough of the OAE2 interval. (vii) a late Cenomanian to early Turonian δ13C plateau phase characterized by benthonic inner ramp sedimentation during a phase of sea-level highstand; (viii) a recovery of δ13C values at the end of OAE2 associated to increased influx of argillaceous facies and reduced carbonate production; (ix) and finally an early to middle Turonian fluctuating δ13C curve, linked to a maximum flooding phase in the Mammites nodosoides Zone and enhanced

carbonate production during the Collignoniceras woollgar Zone.

Results compiled in this work are relevant as they come from very expanded neritic sections in the sub-equatorial eastern Pacific domain of the South America Platform. In summary, the present study underlines the importance of transient environmental perturbations as a possible mechanism to affect neritic carbonate systems during the Albian–Turonian. Changes in depositional style and carbon isotope signatures are possibly affected by the very specific regional palaeogeographic setting of these sections, i.e., the vast but topographically compartmentalized carbonate ramp of the western platform. Regional features also include high rates of basement subsidence and related relative sea-level change, and transient intervals of increased continental run-off under humid climate conditions from the exposed continental shield to the east (present-day Brazil). Despite these regionally important features, however, the sections measured in Peru record clear evidence of global environmental patterns during the mid-Cretaceous. The very expanded nature of these sections allows for a uncommonly detailed temporal resolution of chemostratigraphic features.