Geochemical traces and sequence stratigraphy analysis during the Upper Jurassic in Southern Iberia

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Introduction

Near the region of relative movements between Iberia and Africa, the South Iberian margin was structured in epicontinental and epioceanic environments during the upper Jurassic. This fact determined favourable conditions to record traces of interactions between tectonics and eustasy. Ecostratigraphic and sequence stratigraphy analysis show evidences of this (Marques *et al.*, 1991; Olóriz *et al.*, 1991, 1993). During the Lower and lower Upper Kimmeridgian (Platynota to Acanthicum Zones) two depositional sequences have been identified, the lower one been tectono-eustatic and the upper eustatic in origin. The studied interval is represented by rhythmic successions of marly limestones and limestones 50–115m thick in which some intercalations of marls are significant but irregularly distributed in the Lower (lower and upper Platynota Zone) and Upper Kimmeridgian (lower Acanthicum Zone). Lithologic differences are related with paleogeographic location within the shelf system (onshore-offshore gradient), bottom topography and local conditions favouring buildup growths (Rodríguez-Tovar, 1993).

Sequence stratigraphy characterization has been realized on the basis of facies analysis, stratal patterns, microfacies, grain size and mineralogy; skeletal components have been studied according with ecostratigraphic approaches. The present research is focused on the geochemical analysis of seven sections which were selected in order to give a representative image of the heterogeneity of depositional conditions on the investigated shelf system. The studied sections belong to three sectors in the South Iberian paleomargin (East Algarve Basin, Central Prebetic and Eastern Prebetic) which are differentiated mainly according with subsidence, tectonic activity and their relative proximal-distal location. The studied deposits belong to typical relative proximal depocentres (mid shelf sediments?) where the chemical composition even was strongly influenced by the weathering of source areas, reflecting fluctuations that, in short-time intervals, evidence the relative heterogeneity and instability which characterize proximal water masses. We consider that, as a whole, the geochemical composition of the source areas was similar in the analyzed sectors of the South Iberian margin. Moreover the proven geochemical differences between sections are interpreted to be related with the local paleogeography and/or with variations in those factors controlling the physico-chemical characteristics of the basins on which the sediments were accumulated.

Methodology

The analyses were carried out by means of Inductively Coupled Plasma (ICP) on a Leemans Lab PS1000 equipment. A total of 144 samples of limestones and marly limestones were studied, determining Al, Fe, Mg, K, Na, Ti, Mn, Co, Cr, Ni, V, Li, Sr, Ba, Cu, Y and Zn.

Results

The obtained results are schematically displayed in Fig. 1 which synthesize the record of relative variations through the studied sucessions. Those elements associated with detrital components, mainly phyllosilicates, have grouped as follows: Al-K-Fe-Ti and Co-Cr-Ni-V-Li. The higher content in these elements have been recorded in the East Algarve basin, and the lower ones in the Central Prebetic.

East Algarve Basin, Portugal The studied samples belonging to the bottom and top of the Platynota Zone show the higher content in detrital elements in the area (lines 1 and 2 in Fig.1). The recorded decreasing in the Hypselocyclum Zone is progressively recovered during the Divisum Zone. The Na content is very high, reaching 95000 ppm at times; nevertheless it is worth of mention the

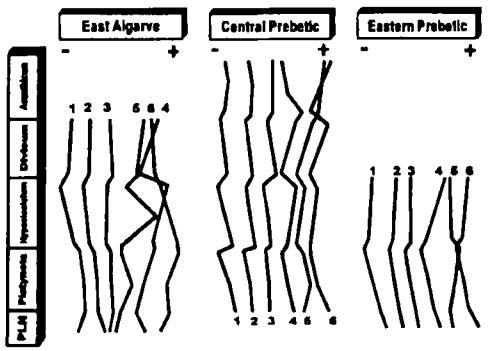

FIG. 1. Distribution of 1: Al-Fe-K-Ti; 2: Co-Cr-Ni-V-Li; 3: Mg; 4: Na; 5: Sr; and 6: Mn through the studied Upper Jurassic successions in Southern Iberia.

low proportion registrated at the bottom of the successions, as well as at the zone boundaries and in those intervals with buildup growths. The high Na content coincides with sharp increases in Sr (> 800 ppm).

Central Prebetic In this sector the lowest content in elements of detrital character is recorded in the studied successions which share identical trends (lines 1, 2 and 3 in Fig. 1). The recorded peaks are registered at the base of the Platynota Zone, at the boundaries between the Platynota, Hypselocyclum and Divisum zones, as well as at the top of the successions, in the Acanthicum Zone. The Na content do not reach 6000 ppm, and the Sr and Mn concentrations are less of 400 ppm.

Eastern Prebetic The general trend observed in elements of detrital character shows a progressive decrease in the Platynota Zone, with a slow recovery through the Hypselocyclum Zone. A high content in Na (above 10000 ppm) has been recorded at the bottom and top of the studied successions.

Final remarks

In the Algarve (South Portugal) as well as in the Prebetic (South Spain), the higher concentrations of detrital elements have been recorded in the Platynota Zone, mainly at the bottom of this zone and in a clear relation with major inputs in siliciclastics. The interpretation of the obtained data in the context of fluctuations in relative sea-level, as proposed by Marques et al., (1991) and Rodríguez-Tovar (1993), shows the coherence between two significant phases of wheathering and the geochemical traces. Moreover, it is assumed the existing relation between increasing record in detrital elements and the proposed sea level fall at the end of the Hypselocyclum zone. The upper decreasing-increasing cycle during the Divisum Zone is sharply disturbed near the top of this zone, that is interpreted as the evidence of tectonic pulses in the South Iberian margin causing local phenomena of sudden weathering in the region. A new fase of increasing in detrital elements during the Acanthicum Zone seems to be related with eaustatic falls.

The high content in Na recorded from the Algarve area is interpreted to be caused by faulting affecting buildups which were located on high blocks. This interpretation is coherent with pulses of salt tectonics which were proposed by Manupella *et al.*, (1988) as the main factor responsible for the structural differenciation of rise bottoms in the area.

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