BIOFACIES DEVELOPMENT RELATED TO UPWELLING SYSTEMS, BASED ON HIGH RESOLUTION BIOSTRATIGRAPHIC STUDIES IN SW VENEZUELA

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Recent biostratigraphic studies in SW Venezuela have reported evidence of several upwelling events. Based on the abundance and diversity of nannofossils, foraminifera, dinoflagellates, and other fossils, assemblages correlated with the lithology show that the area could be represented by Zones II, III and IV of the upwelling model of Jones (1983).

Low-diversity and high-abundance assemblages, typically of opportunistic species, characterise the microfaunal associations. These assemblages are considered survivors of anoxic to partially anoxic conditions, due to the upwelling. The high-productivity conditions, associated with increased salinity and low oxygen levels in the water-mass, resulted in high mortality, reflected by the presence of fish debris and phosphate nodules.

This biostratigraphical and lithological evidence supports a coastal upwelling system model, within a broad continental shelf, similar to the W African margin. The evolution of the upwelling shows an offshore migration of the zones, from the Turonian through the Coniacian–Santonian interval, with a maximum preserved productivity in the Turonian.

There is a change in the nature of the platform sedimentation, from siliceous to phosphate rich, from the Coniacian to the Maastrichtian, indicating variation in the palaeoceanography of the latest Cretaceous SW Tethys platform, probably related to the closing of the Barinas Basin Gulf.

The succession of Biofacies is as follows: **Biofacies 1** Lithology: Dark grey shales and phosphorites. Assemblages: This association is mainly composed of fish teeth, bone fragments, fish scales, phosphate nodules, buliminid foraminifera, *Quadrum*, *Watznaueria* and *Micula* spp. (nannoplankton) platform assemblages, alternating with P>G (Peridinioid > Gonyaulacoid) dinoflagellate assemblages. The TOC varies between 0.81 and 2.80%; **Biofacies 2** Lithology: Dark grey shales, mainly laminated and partially dolomitised limestone. Assemblages: This association contains abundant planktonic and buliminid foraminifera in low-diversity assemblages, diatoms and radiolaria, diagenetically-deteriorated, very poorly-preserved *Micula* spp. assemblages, alternating with P>G dinoflagellate assemblages and very rare traces of phosphate nodules. The TOC varies between 0.21 and 4.65%; **Biofacies 3** Lithology: Dark grey shales, mainly laminated and bedded chert. Assemblages: This association contains predominantly diatoms and radiolaria, scarce planktonic and buliminid foraminifera, *Thoracosphaera* and *Watznaueria* nannoplankton associations and P>G dinoflagellates assemblages. The TOC varies between 0.98 and 1.61%.