

SEA-LEVEL OSCILLATION ON THE PIMENTEIRAS FORMATION (DEVONIAN) IN OUTCROPS OF PARNAÍBA BASIN WESTERN BORDER, BRAZIL

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Parnaíba Basin is located in northwestern Brazil. The main hydrocarbon source rock interval is the Pimenteiras Formation (Devonian), which is composed mainly of dark radioactive shale rich in organic matter. The Pimenteiras Formation deposition occurred during the Devonian (Givetian – Frasnian) and represents one of the most important marine transgression of the Parnaíba Basin (Rodrigues, 1995, Trindade, 2015). This research aimed to evaluate, firstly in a regional way, the thermal maturity, the depositional paleoenvironment conditions and the organic matter quality of 24 samples from 16 Pimenteiras Formation outcrops located in the Parnaíba Basin western border, due to the difficulty to access data from well cutting samples.

The Rock-Eval pyrolysis results indicated a predominance of terrestrial organic matter type (II/III and III). The thermal maturity, determined by conventional geochemical methods, indicated that the organic matter is immature. The depositional paleoenvironment interpretation, using diagnostic ratios of saturated biomarkers, showed a great variability among the samples, specifically, for tetracyclic polyprenoids ratio results (**Fig.1**). C₃₀ tetracyclic polyprenoids are most prominently observed in organic matter derived from fresh-brackish water organisms, and are present in low levels in source rock derived from marine and saline paleoenvironments conditions (Holba et al., 2003). These results suggest the occurrence of a transgressive event related to sea-level rise, at higher rates (Ulmishek and Klemme, 1992).

To confirm and evaluate this event, was chosen one expressive Pimenteiras Formation 15 meters outcrop and collected 11 samples with a 1 meter vertical distance from each other. The use of saturated biomarkers and stable carbon isotopes signatures has highlighted the differences in shale samples collected sequentially to each meter in this outcrop (Freire and Monteiro, 2013). The geochemical characterization results identified two sample groups. The first group is composed by lower two third outcrop samples (lower and middle intervals), which had mixed organic matter, predominantly terrestrial with fresh-brackish water organism contributions and deposited under sub-oxic paleoenvironment conditions. The second group consists of the upper third outcrop samples (upper interval) constituted of mixed organic matter with terrestrial and marine contributions. These samples, characteristically rich in organic matter, represent a marine flooding surface during Frasnian (Late Devonian) in the Pimenteiras Formation (**Fig. 2**).

In this study, should be noted the combined use of diagnostic ratios of saturated biomarkers, such as tricyclic terpanes C₂₀/C₂₁, hopanes/steranes, gammacerane/hopane C₃₀, TPP/(TPP+DIA) and the carbon stable isotopes ratio to interpret the depositional paleoenvironment during relative sea level changes.

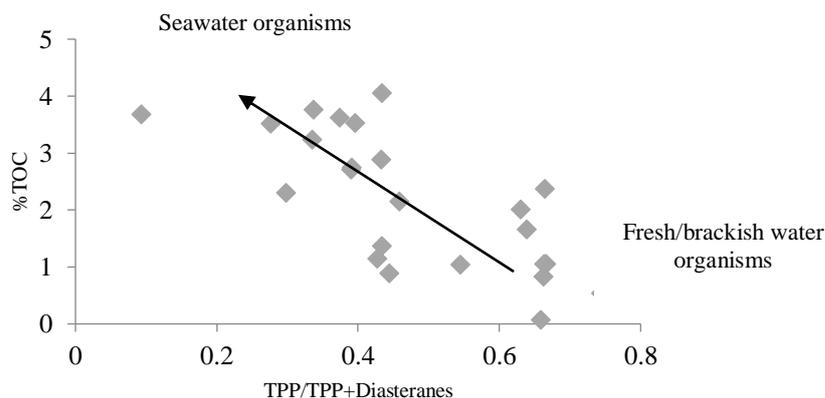


Figure 1. Relationship between Total Organic Carbon content (TOC%) and environmental diagnostic ratio using tetracyclic polyprenoids and diasteranes.

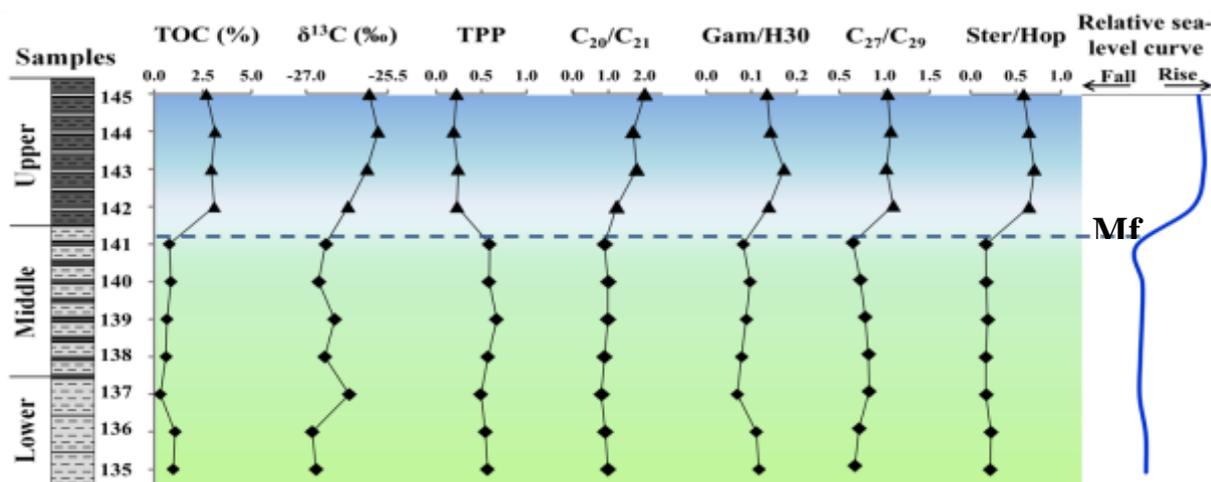


Figure 2. Distribution of TOC%, stable carbon isotopes ratio, diagnostic saturated biomarkers ratios and lithological framework results plotted with respect to the vertical samples position on the selected outcrop.

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