



FORAMS 2006

Paleobathymetric and paleoenvironmental reconstruction of the Oligocene and Miocene deposits of southern Caribbean (Carmen de Bolivar, Colombia) based on benthic foraminifera

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Foraminifera from an Oligocene-middle Miocene stratigraphic section were used to interpret the depositional environments of these deposits. The stratigraphic section (Carmen de Bolivar) located on the arroyo Alferez (Colombia) is 1950 m thick and mainly consists of shale and siltstone with sandstone layers belonging to the Carmen Formation, Oligocene-middle Miocene in age.

Paleobathymetric and paleoenvironmental interpretations were based on the foraminiferal analysis of 160 samples collected every 10-15 m along the entire length of the section.

The foraminifera from the Carmen Formation have been previously studied by other authors for biostratigraphic purposes. In spite of being abundant in the section, specimens smaller than 120 μm have not been analyzed by other authors that previously worked on the Carmen Formation.

This study shows the results of a quantitative analysis of benthic foraminifera greater than 63 μm . Several foraminiferal associations have been identified:

- 1) Associations dominated by planktic foraminifera with variable percentages of benthic foraminifera. The majority of the benthic assemblage consists of calcareous species mainly belonging to the genera *Uvigerina*, *Bulimina*, *Cibicidoides*, *Gyroldina* and *Bolivina*. These associations are interpreted as belonging to normal marine environment from the middle neritic to the upper bathyal zone.
- 2) Association dominated or fully composed by agglutinated foraminifera. The calcareous foraminifera within this association are rare and poorly preserved. The agglutinated foraminifera are abundant, finely to middle agglutinated and mainly small-sized (63-125 μm). This association indicates a turbid water condition and suggests a depositional environment receiving large amounts of land-derived clastic sediments.