Integration of geophysical, geological, and geochemical data for the characterization of the Blue Marker in the Campos Basin

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Abstract

The "Blue" Marker represents a maximum transgressive event during the Neo-Oligocene. It is characterized by light cream-colored calcilutites formed by calcareous nanofossils. In well logs, it exhibits low gamma ray values, high resistivity, high density, and low porosity, compared to the surrounding lithologies. This characteristic eletrofacies, which extends regionally throughout the Campos Basin, although less evident in its distal portions, has a high importance for stratigraphic correlation, well log correlation, and well-tie in seismic sections, once it is a very recognized marker in both well logs and seismic sections. In well 1-BRSA-1289-RJS, the blue marker was identified and sampled at a depth of 3049 meters (MD). This marker is located above carbonate-rich shales ranging in color from light to dark brown, and it exhibits a diversity of microfossil species. To better understand the paleoenvironmental changes that occurred during the Eocene to Oligocene period, we use data obtained from X-Ray Fluorescence (XRF) analysis, Spectral Gamma Ray (SGR), well logs and a detailed lithological description of drilling cuttings to characterize the Blue Marker in terms of lithologies, fossil content and well logfacies. This integrated approach will allow for the inference of environmental conditions and their variations that occurred during this time interval. Through geochemical proxies, the environmental conditions will be analyzed, including climate, salinity, sedimentary input, water oxygenation, and most importantly, the marine regression that occurred in the Eo-Oligocene. The initiation of this prograding process is evidenced by the Si/Ca, Ti/Ca, and Th/U ratios, which indicate an increase in siliciclastic input in shales of the Ubatuba Formation. In addition to these proxies, others will be analyzed to identify fluctuations in relative sea level, as well as the cooling and subsequent warming of the oceans during the Oligocene. Our proposal is to recognize logfacies and chemiofacies to a better understanding of the Blue Marker, and to give more robustness for stratigraphic correlations.

Keywords: Blue Marker; drilling cuttings; well logs; X-Ray Fluorescence; Campos Basin.