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High Resolution Integrated Biostratigraphic and Paleoenvironmental Studies: The Impact on Turbidite Exploration and Field Development

Turbidites are the main oil exploration target in various passive marginal basins all over the world. A well established depositional system approach tied up with refined biostratigraphic and paleobathymetric studies led PETROBRAS to a remarkable exploration success in deep water coastal basins Brazil.

The present work shows how critical paleobathymetric data can be applied to the prediction of turbiditic systems, and how high-resolution biostratigraphy reduces exploratory uncertainties in deep water reservoir exploration and development.

Integration of high-resolution biostratigraphic, paleoecological and sedimentological analyses cuttings and core samples allows to reconstruct the paleobathymetric evolution of depositional environments in deep water settings. Local biostratigraphic datums are calibrated using Haq *et al.´*s (1987) Mesozoic-Cenozoic Cycle Chart, in order to compare local sea-level changes with global ones. The model is based on the presence and distribution of benthic organisms in wells along the paleoslope of a passive margin. Benthic organisms (benthic foraminifera and ostracods) were grouped into assemblages. These were integrated with additional information on the abundance and diversity of planktonic foraminifera, calcareous nannofossils, pollen, spores and dinoflagellates, as well as sedimentological aspects, in order to delineate biofacies.

The stratigraphic and regional distribution patterns of the biofacies observed in the Cretaceous section of the Santos Basin, interpreted in the context of depositional sequences,

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permit to recognize the migration of paleoenvironments and their respective paleobathymetry as well as the orientation and shifts of the ancient shoreline and shelf-break.

The results obtained according to these interpretations had been successful in Santos Basin, where all ranges of paleoenvironments, including marginal, shelf and slope areas are well represented in the siliciclastic Cretaceous sequences. In this context, temporal and spatial variations in paleo-water depth provide information about changes in paleobathymetry, determined by amount of the sediment infill during the basin evolution. Among the effects of tectonism, uplift of marginal areas and salt-tectonics were very important in the development of the Santos Basin depositional history. Variations in paleo-water depth are well related to the responses of local tectonics (local subsidence, uplift of marginal areas and salt-tectonics). In some intervals, such accurate correlation justifies differences between local changes in trends of paleo-water depth and eustatic sea-level changes.

The determination of the age-to-paleobathymetry relationships and an accurate delimitation of marginal, shelf and slope domains provide the basis for the stratigraphic reconstruction and the best prediction of quality and occurrence of the turbiditic reservoirs.

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