Modern Estuaries Analogue Studies in Brazilian Equatorial Coast for Reservoir Characterization: Case Study in Potiguar Basin, North East Brazil

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ABSTRACT

Modern estuaries on NE coast of Brazil has been studied as reservoir analogue of the Potiguar basin. Estuaries on this equatorial coast are characterized by natural high temperature of the air and high evaporation level, low precipitation index, semi-diurnal mesotidal conditions, low sediment input, high speed of the tidal currents and wind. To better understand this unique tropical system, we use an integrated data set composed by meteorological, bathymetric, sonographic, physical oceanography, topographic and sedimentological data, as well as shallow seismic associated with cores. The results indicate that the tidal currents changes from weakly asymmetric to symmetrical, with higher speeds during the ebb-spring tide in the winter period, and directions reflecting the channels orientation. The thermohaline properties classify the system as estuaries and tidal channel with hyper-saline characteristics, behavior of an inverse estuary (negative estuary), vertically very mixed, tidal forced, where the turbulent diffusion process is responsible for the salt transport and by the salinity reduction over the year. The transport of bottom sediments and suspension is controlled by the speed variation of tidal currents. It is more efficient during the spring tides and in the ebb cycles, causing sediments exports. The seabed presents different bedforms (e.g. ripples marks, 2D and 3D sub-aquatic dunes, flat, rocky). The sedimentary facies are represented by siliciclastic sandy and muddy sediments, with amount variation of biodetritic granule and gravel. The sediments texture varies from very coarse sand to silt. Processed shallow seismic data revealed several stratigraphic features of the estuarine deposits, such as: lateral accretion deposits, channel concave erosional base, infill deposits. The cores showed an interfingering between muddy and sandy layers in a coarsening upward trend which are well correlated and extended with the high resolution seismic sections on the study area. The integrated analyses and interpretation led us to better understand the evolution and modern sedimentation on this kind of tropical estuaries and reservoir analogue system.