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Depositional Processes and Facies Distribution in the Orinoco Delta, Venezuela: Constraints for Reservoir Models

The Orinoco Delta, a major tropical depositional system in northeastern South America, encompasses 22,000 km^2 of pristine delta-plain, fluvial-marine transitional, and marine-influenced coastal environments. Investigation of sedimentary processes and facies of this poorly known delta system comprised field reconnaissance in the northwest delta (including shallow cores, radiocarbon dating, and geo-environmental mapping), low-altitude reconnaissance flights, and aerial photomosaic and satellite imagery analyses. Differences in sedimentary processes and facies allowed recognition of two principal delta-plain sectors: southeast and northwest.

Sediment transport is mostly along distributaries in the southeast delta, where channel sands, ~1-3 km wide, 10-20 m estimated thickness, are surrounded by mud and peaty mud. Tides rework mouth-bar deposits, forming dip-elongated sand bodies in estuaries at the terminus of the main channels.

In the northwest delta, channel sands, ~0.5-1 km wide, 5-15 m estimated thickness, are encased in mud upstream and peat downstream, and some transition to bay-head deltas. Interdistributary areas contain peat deposits ~1-10 m thick in areas as large as 200 km^2. The only major interdistributary sands, as much as 5 m thick, occur in crevasse splays covering as much as 5 km^2. Northwest longshore currents, which contribute about half of the coastal sediment from sources as far south as the Amazon River, form mudcapes tens of kilometers long and rework mouth bars into ~10-km-long beach ridges occurring in belts that are 5-15 km wide. Mudcape progradation and bay infill following main channel avulsion resulted in 20-30 km progradation of the northwest delta coastline during the late Holocene.