AAPG Annual Meeting
March 10-13, 2002
Houston, Texas

Elisabeth C. Kosters[1], Frans J. Jorissen[2], Gijsbert J. VanderZwaan[3], John R. Suter[4] (1) International Institute for Aerospace Survey and Earth Sciences ITC, Enschede, Netherlands (2) Dept. of Geosciences, University of Angers, Angers, France (3) Utrecht University, Utrecht, Netherlands (4) Conoco, Inc, Houston, TX

Predicting Deltaic Source Rock Facies Using Sequence Stratigraphy

Borehole, high-resolution seismic and grab sample data from the Holocene Po, RhÙne, Orinoco and Mississippi deltas suggest that development and preservation of source-rock facies in large deltaic systems may be predicted using sequence stratigraphy, paleoecology and (shallow) groundwater behavior. Potential source facies in these Holocene deltas comprise both delta plain peats and organic-rich marine prodelta sediments. These develop at specific times and positions, driven by base level changes and nutrient availability. Data from the RhÙne and Mississippi Delta systems show that peats accumulated preferentially in the accommodation space landward of the retrogradational shoreline(s) in the transgressive systems tract. These mires are predominantly eutrophic, requiring charging by nutrient-rich waters. Charging with groundwater and overbank waters takes place preferentially during relative sea level rise, when nutrient-rich river waters are partially forced to discharge in the delta plain landward of backstepping shoreline(s). During highstand periods, nutrient-rich river and groundwater are preferentially discharged offshore as the system progrades, depriving mires of nutrients and restricting their growth. Paleoecological analyses on Po, RhÙne, Orinoco and Mississippi Delta samples show that eutrophication of prodeltaic shelf sediments occurs in the plume of nutrient-laden river outflow, creating and preserving organic-rich prodeltaic shelf muds. Similar conditions may exist at lowstand, resulting in discharge of nutrient-laden river water and organic rich muds into deeper environments on the outer shelf and slope. Thus, (climate and) base-level driven nutrient balances may generate predictable sequences of source rock facies in large deltaic systems in space and time.