Talk 2

Responses of European estuarine incised valley systems to relative sea level rise: geomorphic implications for sequence stratigraphy and delineation of reservoir flow units — a review

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Abstrak (Abstract)

The implications or impact of geomorphological studies on sequence stratigraphic models have been discussed since the early 1990's for both fluvial systems and coastal/littoral systems. A similar review of such impact on estuarine systems, however, has not been fully incorporated, even though our knowledge of estuarine morphology and processes has improved greatly since the late 1990's. This improvement has come not least from the studies of geomorphologists and oceanographers on Holocene European estuaries, with the aid of increased processing capabilities for numerical modeling (e.g., Shennan and Andrews, 2000; Allen and Pye, 2000). For this reason, at Royal Holloway College, we (SY, KP and DW) reviewed existing sequence stratigraphic models of estuaries from a geomorphic point of view.

Coastal-estuarine geomorphologists have been testing the predictive applicability of sequence stratigraphic models for future estuarine evolution in response to ongoing global sea-level rise. Some of these recent studies suggest that the updip translation of facies/energy zones of an estuary system in response to sea level rise is more complicated than predicted by current sequence stratigraphic models. We will present four main issues based on studies of modern and ancient coastal-estuarine systems in Europe: (1) change in dominant processes, (2) shoreline and bathymetric changes, (3) sensitivity of estuaries to base level rise, (4) formation of peat and minerogenic strata.

Currently at Wyoming and Queen's Universities, we attempt to develop a series of 'process-oriented' sequence stratigraphic models as a tool for higher-resolution correlation and delineation of reservoir flow units, and for more realistic paleogeographic reconstructions. Previous sequence stratigraphic models emphasise the balance between accommodation space and sediment supply, but in an energy setting that is maintained throughout the relative sea level cycle (e.g., a wave-dominated coast/shelf). However, they tend to severely underestimate process changes that can have a significant impact on preserved geometries, facies and heterogeneities on a wide range of scales. We attempt to construct next-generation sequence stratigraphic models by a multi-disciplinary approach with geologists and geomorphologists, utilising modern, Quaternary and ancient tide-influenced deposits in a wide range of basin and paleogeographic settings around the world. This is undertaken with the help of our alliance universities, including the group led by Abdul Hadi A.R. at USM in Penang. This project is currently sponsored by Shell, BP, ExxonMobil, Statoil, ConocoPhillips, TotalFinaElf, Agip, Fortum, DONG and the Norwegian Petroleum Directorate, comprising the FORCE consortium.

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