Predicting Large-Scale Clastic Depositional Systems Using Global Ocean-Atmosphere, Tide and Wave Models: Modern and Maastrichtian Compared

Markwick, Paul J.[1], Roger Proctor[2], Paul J. Valdes[3], Judith Wolf[2], John M. Jacques[1] (1) Petroleum Systems Evaluation Group, GETECH, University of Leeds, Leeds, United Kingdom (2) Proudman Oceanographic Laboratory, Liverpool, United Kingdom (3) Bristol University, Bristol, United Kingdom

The distribution of clastics in the world's oceans is a function of many factors including: the location and nature of sediment input (principally from rivers); transport (through tides, waves, ocean currents and gravity flows); and preservation. The ability to robustly predict these factors provides a powerful exploration tool, especially in frontier basins where data is sparse, and also when integrated with models of productivity, ocean chemistry and stratigraphy.

As part of an on-going study to develop global models for predicting source, reservoir and seal depositional facies, we have used the results of ocean, wave and tide models to identify potential transport pathways and depositional loci. Our initial experiments utilize basic relationships between grain size and transport and settling thresholds, and have been kept intentionally simple in order to maintain model transparency. We have considered current variations within the water column as well as seasonal changes in ocean circulation and terrestrial sediment flux, to provide a first-order, integrated distribution map of sediment size classes. Bathymetry and topography are critical boundary conditions, and so for the Maastrichtian (Late Cretaceous) test case we have utilized robustly defined global palaeo-digital elevation models (palaeo-DEMs), which include an integrated reconstruction of the contemporary palaeo-drainage system. This palaeogeography ultimately depends on the underlying tectonics, which also must be constrained.

Here we present some preliminary results for the Modern and Maastrichtian (Late Cretaceous) illustrating the basic methodology, together with quantitative data-model comparisons.