Bed-scale Clay Distribution Linked to Hybrid Flow Development in Deep-Water Reservoir Successions

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ABSTRACT

Detrital clay is a major factor driving flow behavior, bed-scale heterogeneity and reservoir quality in sediment gravity flow deposits. Quantifying and predicting the details of the clay type and distribution at high-resolution vertically within single event beds and laterally along beds remains a significant challenge. The 500 m thick Pennsylvanian Ross Sandstone Formation, western Ireland has been the target of a recent (2009-2012) behind-outcrop drilling campaign involving Statoil and University College Dublin. This extensive core dataset has identified a wide range of deep-water bed types, including conventional turbidites, hybrid event beds (HEBs) and mass-transport deposits. The bed mix and character of the HEBs closely resembles other systems including the outboard Paleocene Wilcox sandstones in the Gulf of Mexico. A pilot XRF core scanning study has been undertaken to document continuous (200 µm spacing) compositional trends within a range of HEBs, deposited at different points along the flow pathway. Initial results show that Si, K, Ca, Fe and Zr can be used as proxies for quartz, illite, carbonate, chlorite and zircon distribution, respectively. Of particular interest is evidence of vertical segregation of illite and chlorite that may reflect longitudinal and lateral fractionation of clays within the currents.The efficacy of clay mineral fractionation during transport can usefully be explored using settling tank experiments. The proposed work will use polydisperse suspensions of cohesionless ballotini sand and different clay mineral assemblages (kaolinite, illite, montmorillonite, mica etc). This will help to better understand clay fractionation in deep-water successions with important implications for reservoir quality.

AAPG Search and Discovery Article #90321 2018 Grants-in-Aid Projects