Geophysical Research Abstracts
Vol. 18, EGU2016-18298, 2016
EGU General Assembly 2016
© Author(s) 2016. CC Attribution 3.0 License.

Fine-Grained Turbidites: Facies, Attributes and Process Implications

Dorrik Stow and Bayonle Omoniyi
Institute of Petroleum Engineering, Heriot Watt University, Edinburgh, Scotland EH14 4AS, UK

Within turbidite systems, fine-grained sediments are still the poor relation and sport several contrasting facies models linked to process of deposition. These are volumetrically the dominant facies in deepwater and, from a resource perspective, they form important marginal and tight reservoirs, and have great potential for unconventional shale gas, source rocks and seals. They are also significant hosts of metals and rare earth elements. Based on a large number of studies of modern, ancient and subsurface systems, including 1000s of metres of section logging, we define the principal genetic elements of fine-grained deepwater facies, present a new synthesis of facies models and their sedimentary attributes.

The principal architectural elements include: non-channelised slope-aprons, channel-fill, channel levee and overbank, turbidite lobes, mass-transport deposits, contourite drifts, basin sheets and drapes. These comprise a variable intercalation of fine-grained facies – thin-bedded and very thin-bedded turbidites, contourites, hemipelagites and pelagites – and associated coarse-grained facies. Characteristic attributes used to discriminate between these different elements are: facies and facies associations; sand-shale ratio, sand and shale geometry and dimensions, sand connectivity; sediment texture and small-scale sedimentary structures; sediment fabric and microfabric; and small-scale vertical sequences of bed thickness. To some extent, we can relate facies and attribute characteristics to different depositional environments.

We identify four distinct facies models: (a) silt-laminated mud turbidites, (b) siliciclastic mud turbidites, (c) carbonate mud turbidites, (d) disorganized silty-mud turbidites, and (e) hemiturbidites. Within the grainsize-velocity matrix turbidite plot, these all fall within the region of mean size < 0.063mm, maximum grainsize (one percentile) <0.2mm, and depositional velocity 0.1-0.5 m/s. Silt-laminated turbidites and many mud turbidites reflect uniform, steady flow characteristics and a depositional sorting mechanism for silt-clay separation; whereas disorganized turbidites reflect an unsteady flow type, either as a short-lived surge or as a mud-contaminated mid-flow. Fine-grained carbonate turbidites show certain distinctive characteristics linked to the different dynamic behaviour of fine carbonate material. Hemiturbidites are the result of long-distance transport and an upward buoyancy mechanism during deposition.