Paper Number: 4939

Between-hole correlation of sandy and silty contourite beds, Expedition 339, Gulf of Cadiz

Flood, R.D.[1] and Ducassou, E.[2]

[1]School of Marine and Atmospheric Sciences, Stony Brook University, Stony Brook, New York, USA; roger.flood@stonybrook.edu
[2]Université de Bordeaux, UMR CNRS 5850 EPOC, Allée Geoffroy St Hilaire, 33615 Pessac cedex, France

---

Water exchange between the Atlantic Ocean and the Mediterranean Sea has important effects on world hydrography, and the exchange varies on both shorter and longer time scales in response to climate, sea-level and tectonics. Drift deposits cored during IODP Exp. 339 provide new information about the Mediterranean Outflow Water (MOW) history and provide an opportunity to study in detail the sediments created by bottom current flows. The contourite drift sediments are primarily muddy but they often include layers with coarse silt and sand-sized material which appear to be silty or sandy contourites. Several coarser layers have been studied in detail using high-resolution grain size and CAT scanning techniques, along with analysis of the sand fraction and thin section, X-ray and XRF techniques to characterize the beds and the events which created them. These studies suggest that many coarser beds are mixtures of finer sediment, often (but not always) similar in grain size to the sediment deposited before and/or after the bed, and coarser sediment which often (but not always) overlaps in grain size with the finer sediment in the contourite layer. The coarser sediments may have accumulated during numerous shorter episodes of higher-speed flow while the finer sediments may have accumulated at times when flow speeds were reduced. Bioturbation has usually mixed the two or more grain size populations to form the observed layers, and grain-size grading patterns as well as the size and amount of coarser material may relate to the nature of the flow events which formed them. Hiatuses at bed contacts and within beds suggest that flows were erosional at times.

While important information has come from the study of individual layers, additional information about the processes involved in the deposition of coarser materials has come through studying lateral variability of coarser layers that were cored in different holes at the same site. At most sites, two or three drill holes were drilled 10 to 100 m apart to provide a more complete sediment sequence, and sediments in adjacent drill holes can be correlated based on along-core scans and sediment properties. While the nature and sequence of contourite layers in adjacent holes are often quite similar, detailed studies of the sediment sequences show that correlated beds can have somewhat different thickness, grain sizes and layering patterns. This lateral variability may be due to the presence of larger-scale bed forms. The existence of such larger-scale bed forms suggests that while the structure of individual current-created layers may in part be due to changes in the overall bottom flow characteristics, the layer structure can also be affected by the dynamics of the bed forms in question. This can be true of bed forms where bed load is important such as transverse sand waves, but it also can be true of bed forms where bed load transport is less important but where there can be localized erosional effects such as furrows. This kind of large-scale lateral variation may also be useful for identifying current-deposited sediment in outcrop or in units that have been extensively cored.