Seismic Architecture and Topographic Controls on Pliocene Deepwater Deposits, Offshore Angola, West Africa

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Analysis of 3D seismic data provides an opportunity to better understand the range of sedimentary processes and kinematics involved in the deposition of Mass Transport Deposits (MTDs). In this study, 73 km^2 of 3D seismic data is used to study the Pliocene succession offshore Angola where a number of laterally and vertically stacked MTDs are developed.

The submarine slope and basin floor of the study area are dissected by NW-SE-trending normal faults. In the upper- to mid-slope area, this fault system bounds a graben structure, and passes downslope into a salt-cored horst on the lower-slope. The horst subdivides the basin floor into depocentres termed proximal east and distal west. The 1st package of Pliocene sedimentation initiated with a unit characterised by low amplitude, downlapping seismic facies ~3.5 km^2 with a predominantly NW-SE-trending depositional axis; interpreted as the seismic expression of a slope fan. Subsequently, a chaotic seismic facies, the distribution of which is partly controlled by the salt-influenced horst, overlies the fan. This seismic facies is interpreted as an MTD. NNE-SSW-oriented kinematic elements within the MTD include extensional faults (maximum throw of ~18 m) in an upslope location and an open anticline downslope; together, these structures indicate an overall westerly transport direction for the MTD. The MTD has 30-145 m topographic relief along its upper surface and is interpreted as 'frontally emergent', with maximum obduction ~145 m. The upslope edge of the slide is overlain by another ~4 km^2 seismic package which is thought to be another slope fan deposited within a NW-SE sediment fairway. This is in turn overlain by a unit typified by laterally continuous seismic facies. The 2nd, uppermost package contains a mounded seismic unit, also interpreted as an MTD (~730 m wide and ~1900 m long), which is cut by numerous channels and terminates on the eastern flank of the horst. In the uppermost part of the 2nd package, the bathymetric control of the horst diminished and channels and mounded MTDs within this unit overstepped and capped the horst.

This study has demonstrated that seismic facies analysis can provide important insights into the internal anatomy of the Pliocene deepwater stratigraphic sequence offshore Angola, in particular the geometry of MTDs and their role in creating and destroying slope accommodation. This has implications for the geometry and distribution of intercalated sand-rich turbidite reservoirs.