Underwater Physical Modelling – a New Tool in Interpreting Salt Tectonics and Turbidite Deposition

Guerra, M.C.M., Pequeno, M.A., Szatmari, P. and Porsche, E.
PETROBRAS, Rio de Janeiro, Brazil.

Understanding the interplay between salt tectonics and turbidite distribution is highly relevant for offshore hydrocarbon exploration, since turbidite reservoirs host large petroleum reserves.

A new method of physical modelling, entirely developed at the Petrobras Geotectonics Laboratory, was applied to understand salt-related structures and their influence on sediment transport and distribution. These experiments are run under water, permitting to produce turbidity currents and study the geometry of resultant deposits. Sand eroded from the shelf is carried down the slope by turbulent flow and deposited as fans in deep water. The underlying salt escapes towards regions where the overburden is thinner, creating a variety of diapiric structures between turbidite fans. Subsequent sedimentation is controlled by topography resultant from salt movement. Turbidite sands form adjacent to salt structures; their thickness and grain size decrease basinwards.

Structures observed in vertical sections of the models closely resemble those interpreted in seismic sections from the SE-Brazilian continental margin. Such structures include diapirs of various shapes; turbidites deposited adjacent to salt structures; overhangs of mushroom-shaped diapirs intercalated with sediments; salt walls enclosing sedimentary sequences; salt lenses detached from the mother layer; and coalescing overhangs of adjacent diapirs generating a secondary salt layer. This close analogy shows that underwater experiments can be successfully applied to seismic interpretation in evaporite basins.