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Shale Diapirs in an Oblique Contractional Range: Eastern Venezuelan Basin

The main objective of this study was determine origin, evolution and geometry of shale diapirs. Four zones of shale diapirism in the edge of a Miocene accretionary prism were examined using 2-D seismic data from mainland Venezuelan Basin.

Zone I, close to the SE right-lateral Urica Fault, shows a range of structures increasing from one to four from west to east. Structures between the marginal folds show evidences of reactive mud diapirism as well as diapir collapses. Zone II is characterised by normal faulted anticline in the north and an initial buckling anticline evolved to a south vergent structure in the south. Zone III is characterised by an asymmetrical south-vergent fold structure with a long back limb in the north with evidence of normal faulting. Zone IV is characterised by a double mud wall crowned by active mud volcanoes connected to source by normal faults.

Scaled sandbox experiments have been run to simulate the Venezuelan Interior Range evolution using a subduction model. Basement is imbricated inside ductile units folding and faulting the overlying cover. Model results show that sedimentary loading combined with tectonic loading plays an important role in the diapirs formation. Folding of the overburden with the ductile substrate carried along the inflection point, develops mud walls and stocks, while high sedimentation rates produce reactive diapirism and affects the anticline vergences.

Models have shown that Eastern Venezuelan Belt mud diapirs are the consequence of evacuation of shale resulting from tectonic loading and structural vergence influenced by differential sedimentary loading.