FINITE NUMERICAL MODELLING OF STRESS DEFLECTIONS AROUND SALT DIAPIRS IN THE GULF OF MEXICO

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Abstract

This research is focused on the Northern Gulf of Mexico Mississippi Fan Delta. Deltas have a maximum horizontal stress margin parallel (extensional stress regime) at the delta top and a margin normal maximum horizontal stress (compressional stress regime) at the delta toe (King et al., 2010). The area of the delta with intrusive salt diapirs has significantly deflected maximum horizontal stresses around the salt diapirs. This is due to the contrasting geomechanical rock properties between the salt and the deltaic sediments (Zhang, 1994). A 3D seismic survey of the area with vertical salt diapirs was provided by Western Geoco. The seismic data was interpreted for the top salt-sediment contact and diapir related deformation of the sedimentary overburden. The interpretation identified six salt diapirs: four piercing by active diapirism and two piercing by reactive diapirism. 2D finite numerical models were built from representative sections of each salt diapir to predict the principal stress deflections within the sedimentary overburden adjacent the salt. The models of the reactive diapirs deflected the maximum principal stress parallel to the salt-sediment contact of the salt diapirs. The models of the active diapirs deflected the maximum principal stress normal to the salt-sediment contact of the salt diapirs. The stress orientations allowed for borehole stability diagrams to be produced for the stress orientation above the diapir crests, over the diapir flank and over the base salt for each diapiric style.

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