Constraining the evolution of salt-related structures and their influence on deepwater depositional fairways: seismic interpretation and Discrete-Element Modelling along the Moroccan Continental Margin

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Salt tectonics is known to be an important control on the structural configuration of many continental margins. It is a critical mechanism that influences syn-deformational sedimentation and depositional style and has a significant impact on potential reservoir distribution. Salt deformation also influences fluid migration pathways and trap formation.

This study adopts an integrated seismic stratigraphic interpretation and forward modelling approach, using a Discrete-Element Technique, to study salt-related deformation within a passive margin setting, with the aim of characterizing and modelling salt tectonics and associated sedimentation. The integration between forward numerical modelling of salt deformation with seismic interpretation aims to improve constraints for back-stripping the complex margin evolution.

We focus on the Offshore Agadir Basin of Moroccan, on the Eastern Atlantic seabord, an area of recent renewed exploration interest, but one where to-date the predicted distribution of thick high quality sandstone reservoirs has proved elusive. This margin is highly structured following remobilisation of underlying Triassic syn-rift salt, and interpretation of a regional 2D seismic grid has allowed the identification of at least three different structural styles. These can be characterized as 1: a zone in the southern Agadir Basin of upright tear-drop diapirs with associated minibasins and transition seaward to a salt-cored fold-thrust belt, 2: a central heavily structured zone comprising large allochthonous salt features such as canopies, salt sheets and seaward-leaning tongues with associated counter-regional systems, which are landward-dipping expulsion features. Roho-systems, seaward-dipping listric faults detaching on the rear of allochthonous salt sheets, as well as a larger fold thrust-belt at the basinward end of the system can also be observed in the central segment, referred as Talfeney Plateau; and, 3: a northern segment called, Safi Haute Mer, where a smaller volume of salt results in well-defined extensional, transitional, and contractional domains, with salt rollers, pillows, rafts and turtle anticlines updip passing downdip to squeezed salt tongues and allochthonous sheets. This zone is influenced by the presence of large outboard paleovolcanoes that acted as buffers

for the seaward migration of the salt, favouring its movement upward in the stratigraphy, and a much smaller fold-thrust belt that gradually that gradually disappears towards the north.

The study addresses the impact of salt distribution and thickness in the syn rift, depositional slope, presence of buffers to salt movement downslope, and other related controls, on the evolution of salt deformation, and its influence of basin topography and ultimately sediment distribution.