Base-salt Relief Controls Salt-related Contractional Styles in the Translational Domain of the Outer Kwanza Basin, offshore Angola

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Salt-bearing passive margins are typically characterized by thin-skinned, gravity-driven deformation above a salt detachment, resulting in kinematically-linked domains of updip extension and downdip contraction. These domains are commonly connected by a mid-slope translational domain in which salt-related structures accommodate local extensional and contractional strains associated with salt flow across base-salt relief. Despite a general understanding of these salt-tectonic processes and products, little is still known about the detailed geometric and kinematic evolution of mid-slope contractional structures.

We use a high-quality, depth-migrated three-dimensional seismic reflection dataset located in the mid-slope translational domain of the Outer Kwanza Basin, offshore Angola. We analysed the seismic-stratigraphic architecture of the Aptian salt and its immediate Albian overburden to reveal the distribution of local, salt-related contractional structures above varying geometries of base-salt relief.

Our analysis reveals two types of salt-related contractional structures, variably distributed in terms of their trend relative to underlying ramps that trend NW or N. The first type is represented by salt-cored anticlines, the limbs of which may be dissected by salt-detached thrusts. The folds trend parallel to the NW- or N-trending ramps, being located either updip or directly above the underlying ramp. These folds increase in amplitude and decrease in wavelength basinward, and are also locally polyharmonic; showing an upwards increase in wavelength, but a decrease in amplitude. The second type of structure is represented by two sub-types of salt walls: (i) reactive salt walls, and (ii) squeezed salt walls. These salt walls trend broadly parallel to, and are located above or downdip of NW-trending, basinward- and landward-facing ramps. The salt-cored anticlines are formed by local contraction associated with salt flow deceleration above ramp-updip. This process of local contraction also locally induces active rise and overburden piercement as salt walls translate over local base-salt structural highs. Still, other salt walls are locally contracted on the basinward-facing ramp during salt flow seaward, resulting in the squeezed salt wall.

We show that careful seismic-stratigraphic analysis of salt and overburden deformation, in the context of the underlying base-salt geometry, reveals complex patterns of salt structure evolution.
during seaward translation across the midslope translational domain. The results are applicable along salt-bearing passive margin worldwide and may provide an important insight in identifying potential plays along the midslope translational domain, where major deepwater oilfields reside.