

## **Impact of Thin- and Thick-Skinned Salt Tectonics on the Mesozoic Reservoir Potential of the Cleaver Bank High and Broad Fourteen Basin, Dutch Sector, Southern North Sea**

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### **ABSTRACT**

The Cleaver Bank High and Broad Fourteens Basin in the Southern North Sea are part of the inverted rift basins of the Southern Permian Basin which includes a several km thick Zechstein megahalite succession. Thick- and thin-skinned salt tectonic processes during multi-stage rifting and inversion in Post-Permian times strongly influenced the basin evolution and HC prospectivity. This study investigates thick- and thin-skinned salt tectonic processes of the Broad Fourteens Basin and adjacent platforms and their impact on the Mesozoic hydrocarbon potential. Structural, seismic-stratigraphic, and seismic attribute analysis of a basin-scale 3D seismic subset of the SNS MegaSurvey (PGS) enabled us to analyse the relationship of multi-stage rift, inversion, thick-skinned and thin-skinned salt tectonic processes. Rifting in Triassic and Jurassic times triggered early reactive and halokinetic intra-basin salt structures. Strong inversion of basement structures during the Late Cretaceous caused contractional reactivation and growth of salt walls and diapirs on the adjacent platforms. Since Late Cenozoic times gravity-driven thin-skinned salt tectonics created extensional diapiric collapse structures and salt welds. Regional structural sections enable the correlation of contrasting structural styles in the Broad Fourteens Basin and Platform areas. Most salt structural traps formed during inversion in the Late Cretaceous and include 4-way/3-way dip closures and salt juxtaposed trap geometries. Sub-salt and supra-salt structural maps show hard- and soft-linked salt structures and salt welds highlighting potential migration pathways from pre-salt sources to post-salt reservoirs. Lower Triassic sands show regional extend. Upper Jurassic sands are only preserved in the basin centre due to strong inversion. Re-deposited and fractured Chalk sediments in areas close to salt-cored folds and contractional diapirs are related to Late Cretaceous and Miocene inversion and show additional reservoir potential. Seismic attribute analysis around amplified salt walls has identified extensive slumps, slides, contourites and clinofolds in Chalk sediments as well as extensive faulting and fracturing around contractional diapirs. Study results show strong linkage between rifting, inversion and salt tectonics in the Broad Fourteen Basin and adjacent platforms. Play concepts derived from salt tectonic analysis include new migration pathways, trap styles, and potential reservoirs.