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3D Geometry of Salt Controlled Normal Faults on Friesland Platform - NW Netherlands

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A detailed 3D structural modeling was carried out using the available 3D seismic reflection and borehole data, in order to reveal the structures and deformation history, associated with the dynamic evolution of the Middle-Late Permian age Zechstein salt layer in Northern Friesland - Netherlands.
The model includes major structures and seismostratigraphic units of Permian to recent, revealing salt and salt induced structures, formed during the periods of active salt movement in the study area. The model indicates a thick salt layer formed on N-S oriented grabens and half grabens of South Permian Basin that acted as the primary control for the location of salt diapirs and reflected the basement deformation pattern to the cover. A major salt movement was initiated in Triassic, during E-W Mesozoic rifting i.e breaking up of Pangea, evidenced by rim-synclines on Triassic mini-basins. Structurally conformable layers of Cretaceous and Early Cenozoic units overlie Triassic units unconformably by base Cretaceous unconformity, deposited during a tectonic quiescence when salt movement was ceased. A second phase of salt movement took place during the Early Cenozoic that was triggered possibly due to the compressional tectonism related to Late Cretaceous - Early Tertiary Alpine Orogeny. A final and still ongoing phase is observed in the slightly deformed Neogene and Quaternary units. The model represents a N-S oriented salt cored anticline and a convergent transfer zone between a pair of segmented normal growth faults, controlled by the salt movement. Major faults associated with the transfer zone have assymetrical half graben geometry away from the transfer zone and symmetrical graben structure with small scale synthetic and antithetic faults at the center of the transfer zone. Detailed study of the structural model in 3D with the aid of cross sections, allows the establishment of the architecture of the transfer zone and its relation with the salt deformation process.