3D internal structure of the Zechstein evaporites.

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Salt structures are often seen in two different levels: studies of the over- and underburden show salt as homogeneous, structureless bodies, while detailed underground studies show folds faults and boudinage.

3D seismic interpretation of large-scale structures observed in the complexly folded and faulted internal structure of Zechstein salt bodies in NW-Europe compare well with data from salt mines and analogue and numerical models and give new insights in large scale 3D internal geometry of salt bodies. A 40 m thick brittle- ductile claystone- carbonate- anhydrite layer, the "Z3 stringer" is encased in ductile salt and forms an excellent seismic reflector.

Extensive seismic mapping over the northern Netherlands, structures observed are a network of thicker zones, inferred to be formed during early karstification. Later, this heterogeneous unit was deformed into large scale folds and boudins by flowing salt. Non-plane-strain salt flow produced complex fold and boudin geometries. There is some evidence for a feedback between the early internal evolution of this salt giant and the position of later salt structures.

The stringer has a higher density then the surrounding halite, and in the literature there is some controversy concerning the sinking rates. We observed no structures indicative of sinking, but conclude that the present-day position of the blocks can be explained by internal folding of the salt. This conclusion is corroborated by observations from mines, and by better understanding the effect of the distribution of grain boundary water in evaporite microstructures on deformation mechanisms and rates.

This work has shows that the internal geometry of the Zechstein evaporate is extremely complex, but can be studied using high-quality 3D reflection seismic dataset. The internal geometry of salt deposits rival the internal structure of mountain belts.

References

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