$\delta^{34}S$ and $\delta^{18}O$ analyses of Upper Permian sulphates from the Northern German Zechstein Basin

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Salt rocks of the Zechstein, Upper Permian, are regarded as possible host rocks for radioactive waste disposal in Germany. Most of these rocks consist of halite with anhydrite impurities, or are anhydrite rocks, respectively. To characterize the genesis of these rocks and to verify the ability of stable isotope gechemistry for stratigraphic classifications of salt rocks, $\delta^{34}S$ and $\delta^{18}O$ analyses of sulphates from different stratigraphic units were performed.

Altogether, 112 sulphate samples were collected from three different salt structures in Northern Germany. The samples cover a wide range of the Zechstein units z2 (Staßfurt Formation) – z4 (Aller Formation).

The $\delta^{34}S$ results (analyzed via EA-IRMS) display a relatively homogeneous isotopic composition between 9.2 ‰ and 11.3 ‰ ± < 0.3 ‰ (VCDT), which is in good agreement with literature data (e.g. [1, 2]). Within a stratigraphic unit (salt cycle), the values decrease by ca. 2 ‰ from basis to top, and increase again at the basis of the subsequent unit by ca. 1.5 – 2 ‰. This repeating trend reflects progressive evaporation/precipitation, followed by inflow of unevaporated seawater and subsequent evaporation within the basin.

The $\delta^{18}O$ isotopic composition (analyzed via TC/EA-IRMS) shows distinct variations between 8.2 ‰ and 13.8 ‰ ± < 0.5 ‰ (VSMOW), which is comparable to published data (e.g. [2]). These variations are more pronounced and exhibit short-term changes in evaporative conditions.

Finally, no indications for postsedimentary changes by groundwater or extrasalinare brines are discernible, which is important for long-term safety considerations.

[1] Kampschulte and Strauss (2004) *Chem. Geol.* **204**, 255-286. [2] Claypool *et al.* (1980) *Chem. Geol.* **28**, 190-260.