



Stratigraphy, sedimentology and diagenesis of the Zechstein carbonate-evaporate cycles onshore northern Netherlands

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Although most gas volumes in northern Netherlands are produced from Rotliegend reservoirs, Late Permian Zechstein reservoirs have been an exploration target for the last decades. Most Zechstein gas reservoirs are found in the Zechstein 2 Carbonate Member, but some minor findings are reported from the platform facies of the thinner Zechstein 3 Carbonate Member. Such reservoirs overlain by thicker anhydrite beds may constitute profitable hydrocarbon reservoirs, but also represent a potential drilling hazard due to high fluid overpressures and/or unexpected brine chambers. This work aims to give an overview about the stratigraphy, sedimentology, and diagenesis of the Zechstein interval from the Zechstein 2 Salt to Zechstein 4 in order to evaluate the reservoir potential. The results of this work are based on observations of core samples, cuttings, thin sections, seismic data, and geophysical well logs as well as XRD analyses. Combined, these data were the basis to investigate the mineralogy and porosity of the Zechstein carbonate-evaporate cycles. The basin facies of the Z3 Carbonate Member consists of either aphanocrystalline dolomite or magnesite with high amounts of anhydrite, plugging pores and decreasing the reservoir potential. Some open pores and fractures were only found in Zechstein 2 anhydrite layers, whereas most pores are plugged with halite. A further focus is put on the origin, composition, and deformation of anhydrite intercalations (intra-salt stringers) fully embedded in the Zechstein 2 Salt Member as well as to salt tectonics affecting the study area, and structures pointing to former overpressures, like a younger clastic dike squeezed into the Zechstein, indicating a high-pressure regime.