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The Origin of Salt-Encased Sediment Packages: Observations from the SE Precaspian Basin (Kazakhstan)

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Intrasalt sediment packages containing siliciclastic sediments, carbonate sediments, or non-halite evaporites such as gypsum or anhydrite are common within most salt sequences. Intrasalt sediment packages may have been deposited before, during, or after salt deposition and be incorporated into the salt by various processes. Understanding the origin and evolution of intrasalt sediment packages may yield important insights into the tectonic and geodynamic history of the basin, and also into the understanding of salt tectonics. Despite the importance of intrasalt sediment packages, currently there is no systematic description of their possible origins and their distinguishing criteria.

This work is divided in three parts. First, we outline the possible origins of intrasalt sediment packages, as well as criteria to determine if they originated as subsalt, suprasalt or intrasalt sequences. Second, we examine how sediment packages that originated on top of salt, such as minibasins, can be encased within salt. We propose four key processes by which salt can be expelled and emplaced above minibasins to encase them: a) salt expulsion from beneath a minibasin experiencing density-driven subsidence; b) salt expulsion from beneath adjacent subsiding minibasins; c) salt expulsion associated with lateral shortening; d) override of minibasins by a salt sheet sourced from elsewhere. Third, we present a case study from the SE Precaspian Basin, Kazakhstan, where, using a borehole-constrained 3D seismic reflection dataset, the proposed criteria are applied to an area with abundant, newly discovered sediment packages within salt.