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# Mechanical stratification of autochthonous salt: Implications from basin-scale numerical models of rifted margin salt tectonics

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Deformation of salt and sediments owing to the flow of weak evaporites is a common phenomenon in sedimentary basins worldwide, and the resulting structures and thermal regimes have a significant impact on hydrocarbon exploration. Evaporite sequences ('salt') of significant thickness (e.g., >1km) are typically deposited in many cycles of seawater inundation and evaporation in restricted basins resulting in layered autochthonous evaporite packages. However, analogue and numerical models of salt tectonics typically treat salt as a homogeneous viscous material, often with properties of halite, the weakest evaporite. In this study, we present results of two-dimensional plane-strain numerical experiments designed to illustrate the effects of variable evaporite viscosity and embedded frictional-plastic ('brittle') sediment layers on the style of salt flow and associated deformation of the sedimentary overburden. Evaporite viscosity is a first-order control on salt flow rate and the style of overburden deformation. Near-complete evacuation of low-viscosity salt occurs beneath expulsion basins, whereas significant salt is trapped when viscosity is high. Embedded frictional-plastic sediment layers (with finite yield strength) partition salt flow and develop transient contractional structures (folds, thrust faults, and folded faults) in a seaward salt-squeeze flow regime. Multiple internal sediment layers reduce the overall seaward salt flow during sediment aggradation, leaving more salt behind to be re-mobilized during subsequent progradation. This produces more seaward extensive allochthonous salt sheets. If there is a density difference between the embedded layers and the surrounding salt, then the embedded layers 'fractionate' during deformation and either float to the surface or sink to the bottom (depending on density), creating a thick zone of pure halite. Such a process of 'buoyancy fractionation' may partially explain the apparent paradox of layered salt in autochthonous salt basins and thick packages of pure halite in allochthonous salt sheets.