FORMATION OF SALT WITHDRAWAL MINI-BASINS: INSIGHTS FROM MARGIN-SCALE NUMERICAL MODELS

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Salt tectonics at passive continental margins is investigated using a large deformation 2D finite element model of frictional-plastic sediments overlying a viscous salt layer. In particular, we focus on the formation of salt withdrawal mini-basins in the context of a larger scale model of passive margin salt tectonics, driven primarily by sediment progradation.

Sediment progradation causes a differential load on the underlying salt, which can cause the system to become unstable, resulting in proximal extension accommodated by distal contraction. During sediment progradation, the model undergoes a diachronous evolution comprising four main phases: 1) initiation of salt flow and the formation of mini-basins and diapirs; 2) onset of extension of the sedimentary overburden; 3) wholesale extension and rafting of sedimentary overburden; 4) formation of a distal allochthonous salt nappe.

Mini-basins initiate during phase 1, and begin as dimples on the salt-sediment interface while the overburden is thin. The length-scale of the dimples is hypothesized to be a function of salt layer thickness. The dimples grow into true mini-basins as more sediment is added and preferentially accumulates in the mini-basin low points, and salt is evacuated so that accommodation space is continuously created. Salt evacuated from beneath the growing mini-basins accumulates into diapirs separating the mini-basins.

The growth of mini-basins is sensitive to the density contrast between salt and sediments, progradation rate, and the geometry of the prograding wedge. Model results will be presented that describe both basic mini-basin formation and in models incorporating sediment compaction and lateral variations is sand-shale content.