FORWARD MODELING OF SALT TECTONIC RESPONSE TO SEDIMENTARY LOADING AND BASEMENT SUBSIDENCE

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We investigate salt tectonics in passive continental margin settings using a 2-D finite element numerical model of a frictional-plastic material overlying a viscous salt layer. In particular, we focus on the effects of sediment progradation, isostatic adjustment, regional tilt, and the differential density between the salt and overburden.

Sediment progradation causes a differential load on the underlying salt, which leads to the formation of a region of landward extension, accommodated by basinward contraction. We investigate how sedimentation patterns such as progradation, aggradation and multiple cycles of sedimentation followed by periods of starvation affect the structural evolution. The basement response to sedimentation is also considered, and isostatically balanced models that include the load of water and deposited sediment are presented to show the effect isostasy has on the stability and style of salt tectonics produced in the model.

The effect of regional tilt (due to, e.g., post-rift thermal subsidence) on a salt layer is also analyzed. Model results show that regional tilt can destabilize overburden without differential loading by sediment. This may have been an important process in areas where salt was mobilized soon after deposition, and without significant overburden. When combined with sediment progradation, basinward tilt of the salt increases salt and overburden flow rates.

Finally, we discuss the effect of the differential density between salt and overburden. Model results show that buoyancy forces are of secondary importance and that these systems are driven primarily by differential pressure forces resulting from differential sediment loading.