**Stress changes associated with the evolution of a salt dome into a salt sheet**

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## ABSTRACT

We study how stresses change as a salt diapir evolves into a salt sheet. We find that the horizontal stress in the upper parts of the sedimentary basin decreases significantly following the advance of the salt sheet (without syn-kinematic sedimentation).

During the salt-dome rise, ongoing sedimentation increases the average density within the basin to values higher than the density of the salt. As a result, the basin over-pressurizes the salt, causing a horizontal thrust loading onto the wall rocks. However, as the diapir evolves into a sheet, the effective height of the salt dome drops by about one kilometer and hence, the stress within the salt decreases. This salt stress decrease together with the negative traction from the advancing sheet lead to a smaller horizontal stress within the basin (Fig. 1).

Our results highlight a change in the orientation of the minimum principal stress from circumferential (radial faults) to radial (circumferential faults). Furthermore, the fracture gradient drops below the advancing sheet (Fig. 2).

We built this axisymmetric model within the large-strain Finite Element program Elfen. We model the salt as solid visco-plastic, with the Munson & Dawson (1979) model and the sediments as poro-elastoplastic, with a generalized MCC model (SR3, in Elfen).

**CLICK ON IMAGE FOR LARGER VIEW**

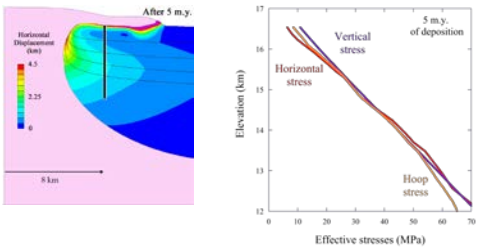



**Figure 1**: Vertical stress profile below the advancing salt sheet. Negative traction from the sheet and a decrease in the salt stress lead to a decrease in the horizontal stress within the wall rocks.

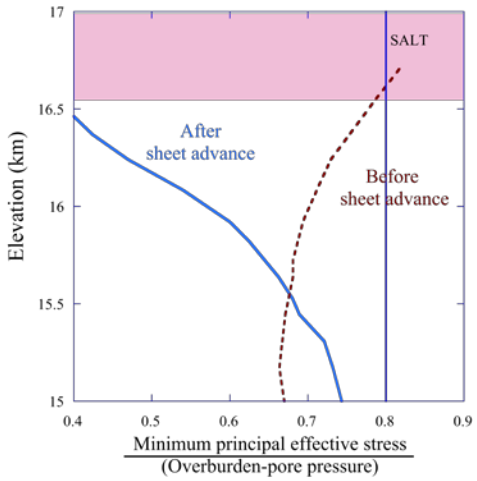
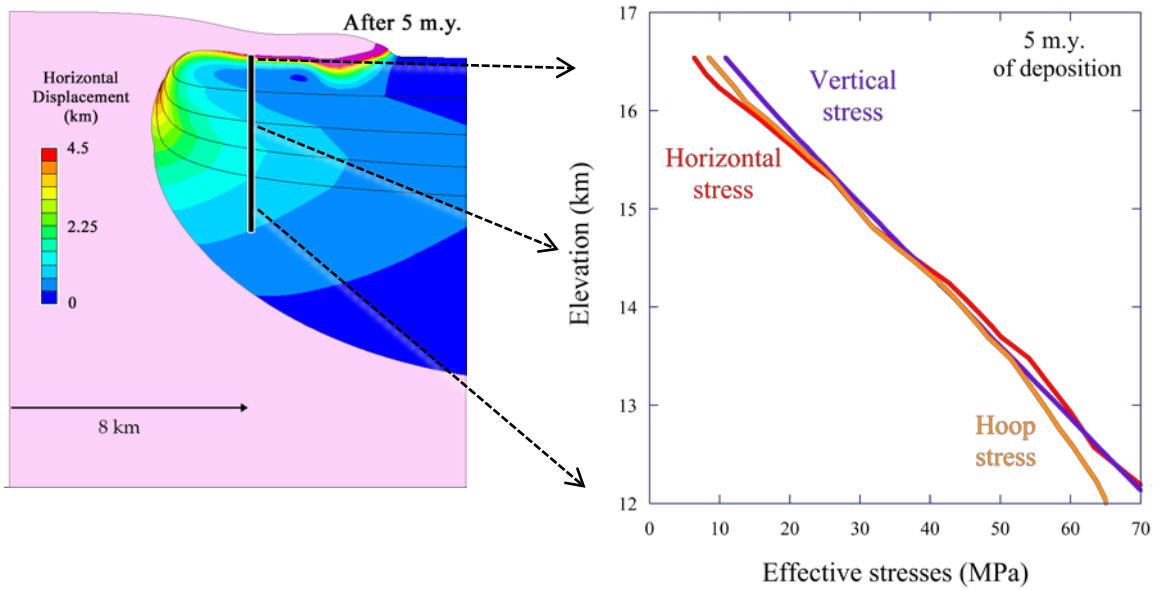



**Figure 2**: Ratio of the minimum effective principal stress to effective overburden before and after the salt emplacement. The stress ratio is notably reduced below the advancing salt sheet.




Vertical stress profile below the advancing salt sheet. Negative traction from the sheet and a decrease in the salt stress lead to a decrease in the horizontal stress within the wall rocks.

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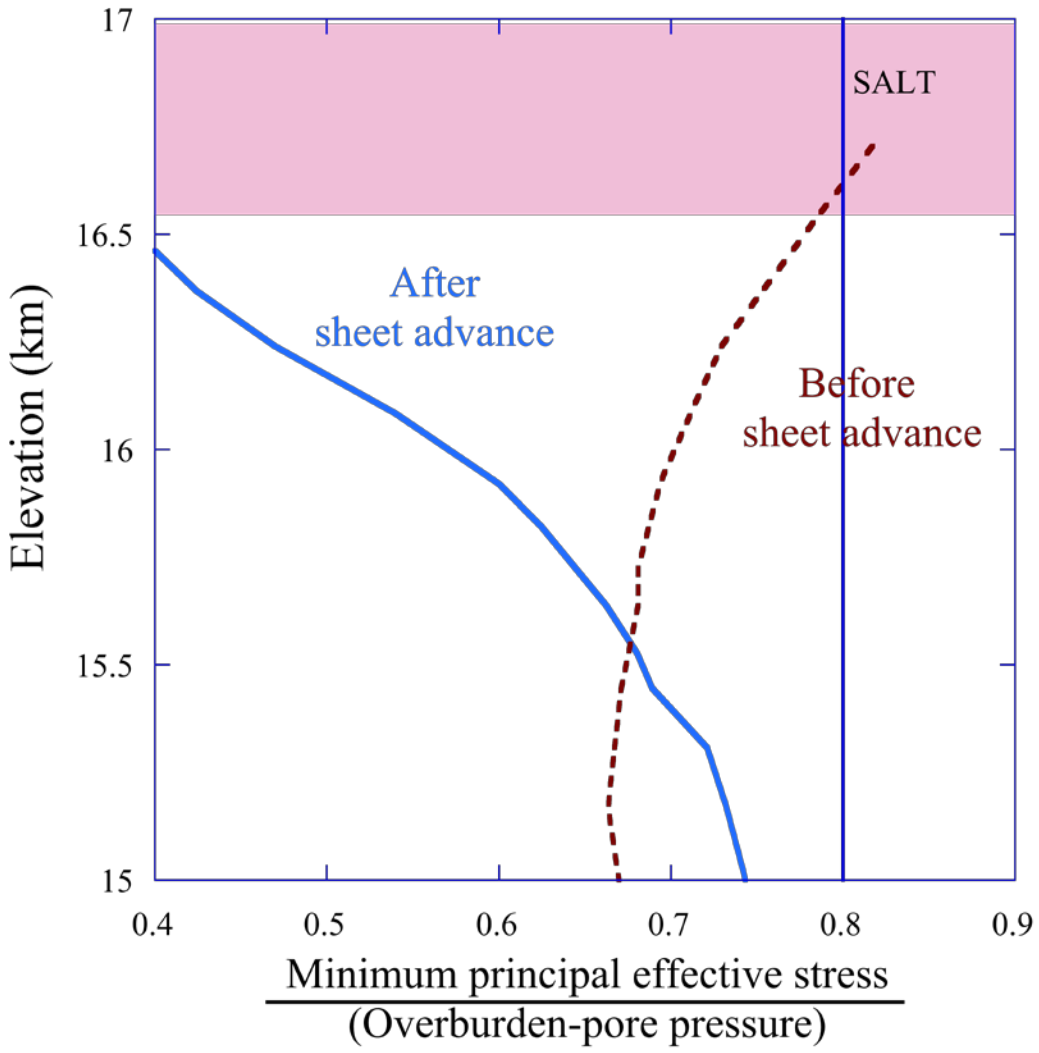


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