Insights into stress and pressure near salt

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ABSTRACT

We compile findings from our geomechanical modeling effort over the last 10 years to provide insights into pore pressure and fracture gradient near salt. The stress state in salt is practically uniform with value close to overburden stress. This drives an increase in lateral stress near steep salt faces (e.g., upper parts of domes, minibasins, overhangs – Fig. 1) and can explain elevated fracture gradients near salt. We find that pore pressure below salt sheets can be as high as the overburden stress, unless permeable beds provide regional fluid migration paths to dissipate the overpressure. Furthermore, we systematically observe that basin bending associated with the evolution of a salt diapir-sheet system leads to a decrease in the least principal stress below salt. As a result of both elevated pressures and decreased least principal stress, we find a narrow drilling window below the major part of salt sheets (Fig. 2).

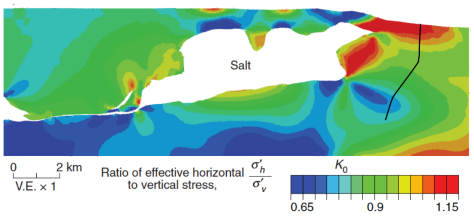


Figure 1: Ratio of horizontal to vertical effective stress near the Mad Dog salt body (Heidari et al; 2018; Geophysics). Lateral loading from the salt increases the horizontal stress in minibasins and in front of the salt body.

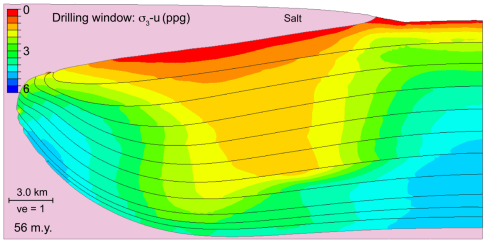
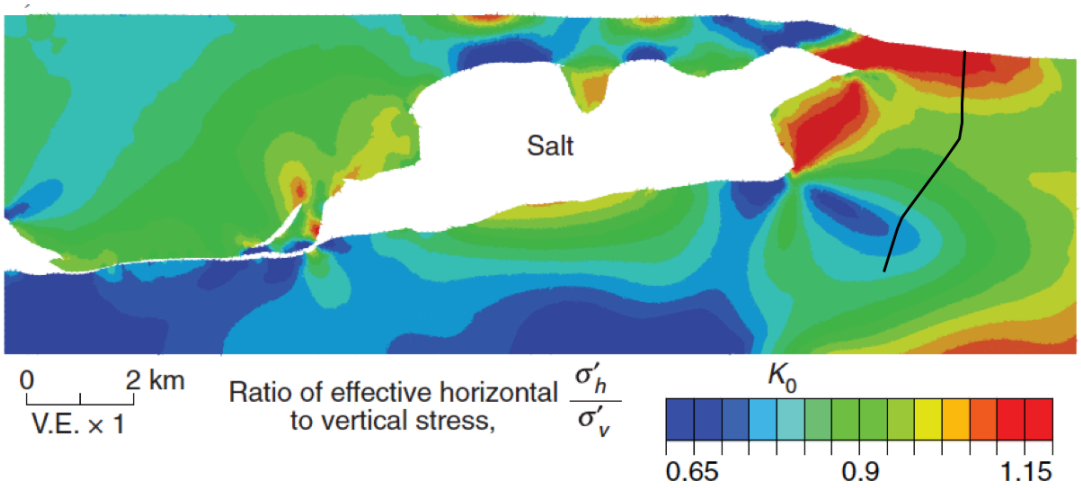


Figure 2: Difference between least principal stress and pore pressure in salt basin, in equivalent mudweights (ppg). The resulting drilling window is very narrow below the majority of the salt sheet base.



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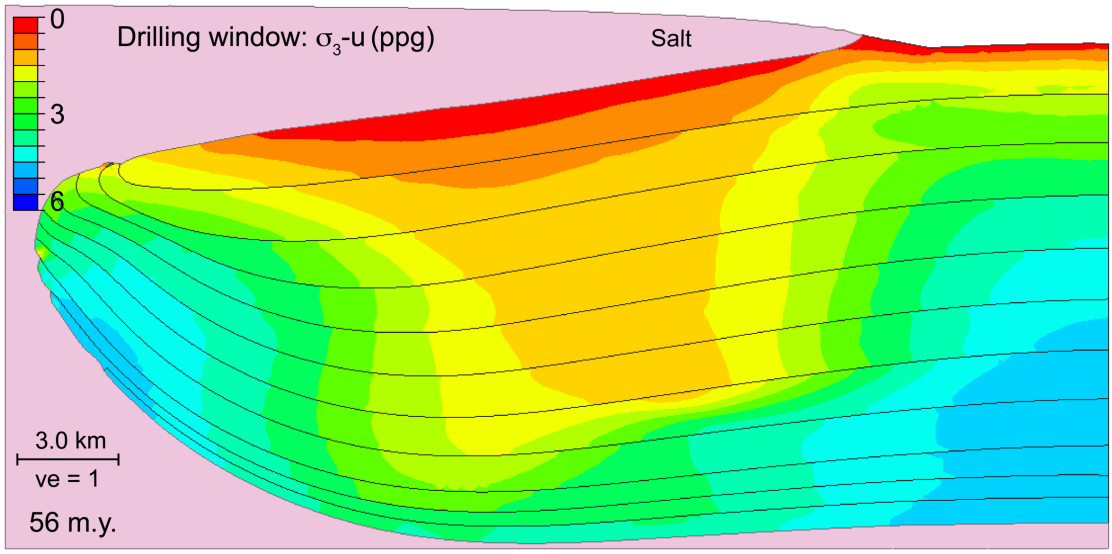
Back



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Back