

12.25: Pressure and stress in an extensional basin with pre-existing fault and salt roller

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ABSTRACT

We study pressure and stress in an extensional basin with a pre-existing fault and a developing salt roller using transient evolutionary models (Fig. 1). We simulate flow across the fault and accumulation of permeable sands in the downslope fault block. We find that deposition on top of the basin and loading from the rising salt increase overpressure, whereas the regional extension and porous fluid flow towards permeable layers and across the fault decrease the final pore pressure. Sands in the growth section have a lower stress ratio, resulting from their different mechanical properties, and specifically a higher friction angle. This results in a lower horizontal stress (Fig. 2), which decreases the lateral support for the footwall mudrocks, amplifying the extension effect and further decreasing overpressure. We built these transient models in Elfen. Sediments are poro-elastoplastic. Sediment input has been calibrated using experimental observations on GoM Eugene Island mudrocks and published sand properties.

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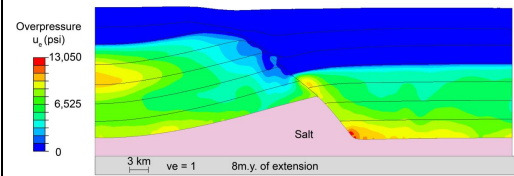


Figure 1: Overpressure predicted by transient evolutionary model of an extending basin with a pre-existing fault and a salt roller. Overpressure is higher near the steeper salt face and lower in the footwall across from the growth-section sands.

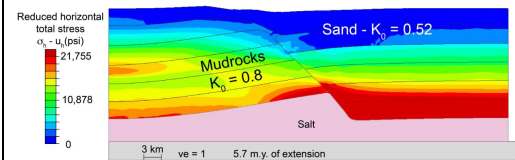


Figure 2: Reduced horizontal total stress in basin. The growth-section sands have a lower stress ratio (higher friction angle), which results in a decrease in horizontal stress, hence in lateral support for the footwall sediments.

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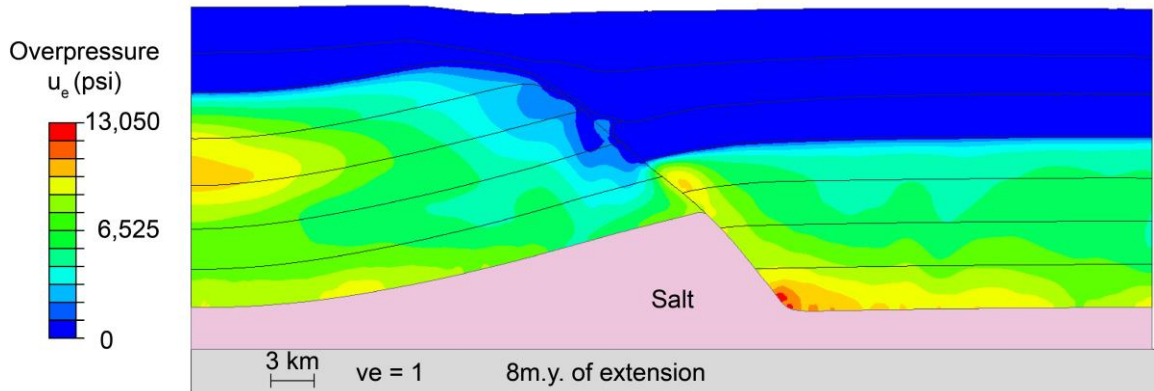


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[Back](#)

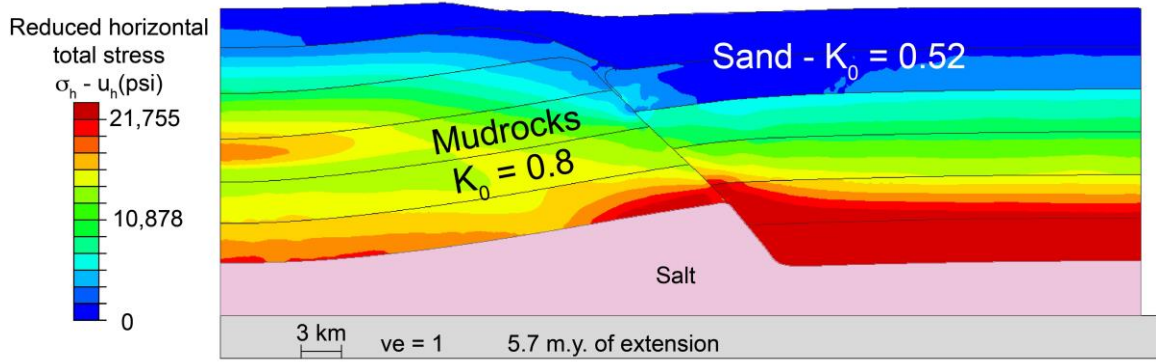


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[Back](#)