

Pore pressures below an advancing salt sheet: Incorporating mean and shear stress

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ABSTRACT

We predict how overpressures develop below an advancing salt sheet (Fig. 1). We show that most of the imposed salt weight is supported by overpressure. This results in low effective stress and high shear levels. The difference between pore pressure and least principal stress below the middle of this salt sheet is less than 1 ppg.

We compare our geomechanical prediction with porosity-based pressure prediction workflows. We show that the mean total stress has a significant contribution to pore pressure; hence pressure-prediction workflows based on total mean stress are better than uniaxial ones. However, shear-induced pore pressures are also important. We show that porosity-based workflows that only account for the total mean stress will under-predict pressure in areas where differential stresses are higher than uniaxial (Fig. 2).

We built this transient evolutionary model with Elfen, and model sediments as a poro-elastoplastic material. Consolidation properties are calibrated based on our in-house experimental program on Eugene Island material.

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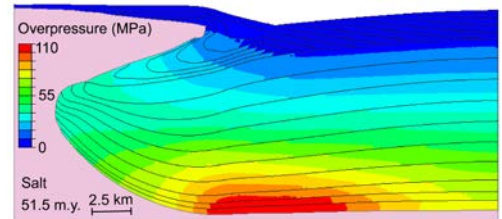


Figure 1: Overpressures developing below an advancing salt sheet.

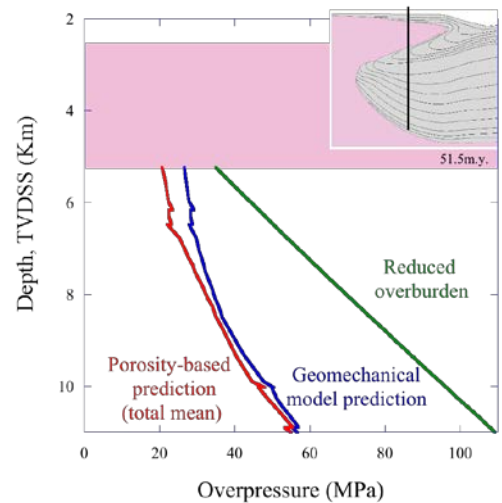


Figure 2: Vertical profile below salt showing overpressure prediction based on porosity and total mean stress (red line), compared to geomechanical model prediction (blue line). Ignoring shear-induced pore pressures under-predicts the overpressure.

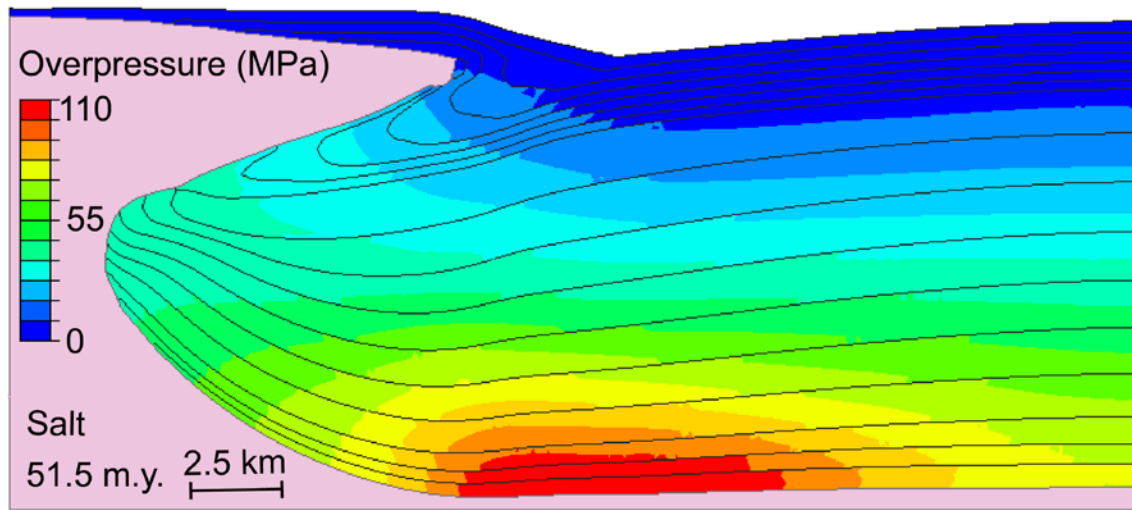


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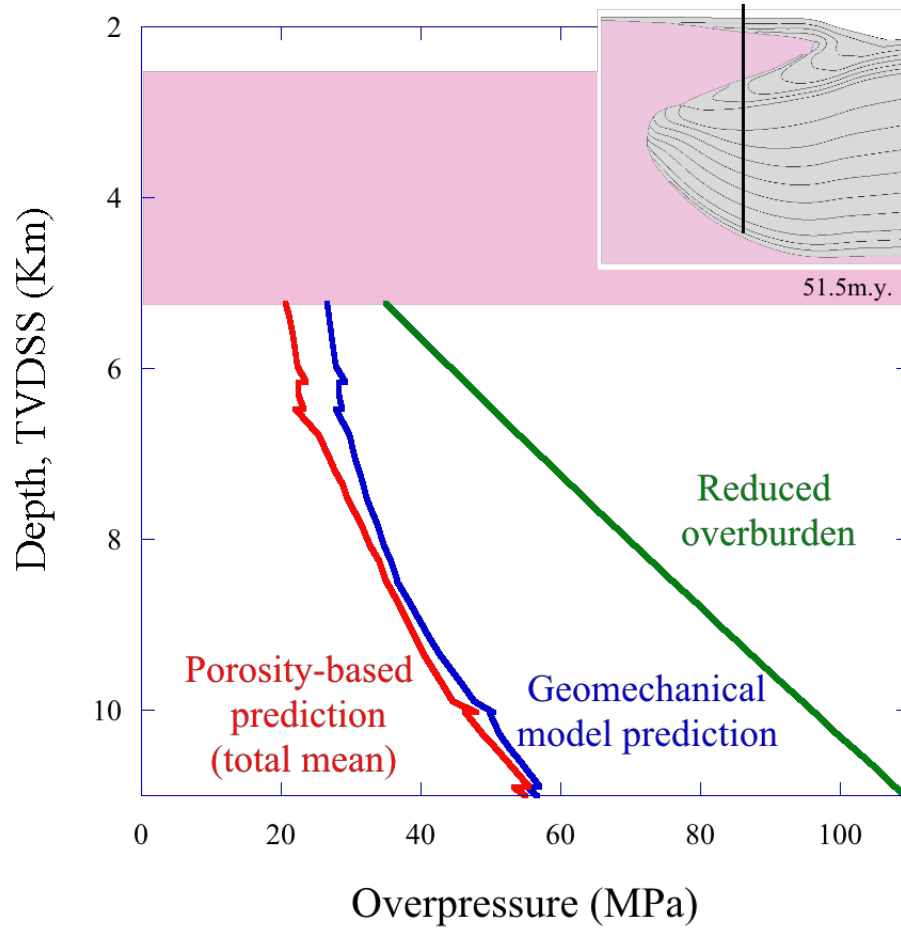


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