9.11: Log-based Pressure Prediction in the Mad Dog Field with the FES Method

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ABSTRACT

I predict pressure at the Mad Dog field, GoM using three different approaches that are based on (a) vertical effective stress (VES), (b) mean stress (MES), and (c) the full stress tensor (FES). A large salt body at the Mad Dog Field creates non-uniaxial stress conditions; this leads to either an elevation or a reduction in mean and/or shear stress (Fig. 1). The VES and MES approaches assume uniaxial conditions to calculate effective stresses. In contrast, the FES method employs geomechanical modeling to account for the contribution of both mean and shear to compression. I quantify the fraction of pressure driven by mean vs. shear stress (Figs. 2). I demonstrate that the FES approach closely predicts measured pressures below salt (Fig. 2), whereas both the VES and MES approaches under-predict pressure by 1.5 ppg (Fig. 2). Overall, I show that the FES method can be used to improve pressure prediction in fields with complex, non-uniaxial stress conditions.

CLICK ON IMAGE FOR LARGER VIEW

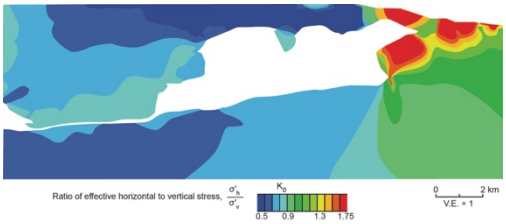


Fig 1: Non-uniaxial stress field around a Mad Dog salt, GoM. Contours show ratio of horizontal to vertical effective stress and illustrate elevated horizontal stresses in front of the salt and in mini-basin.

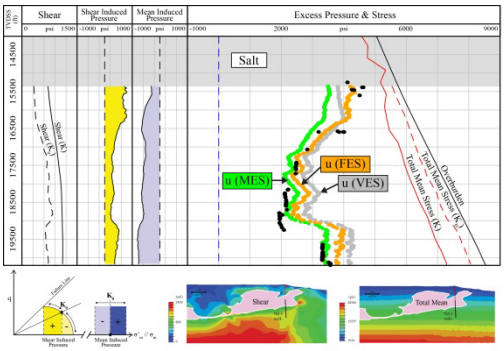
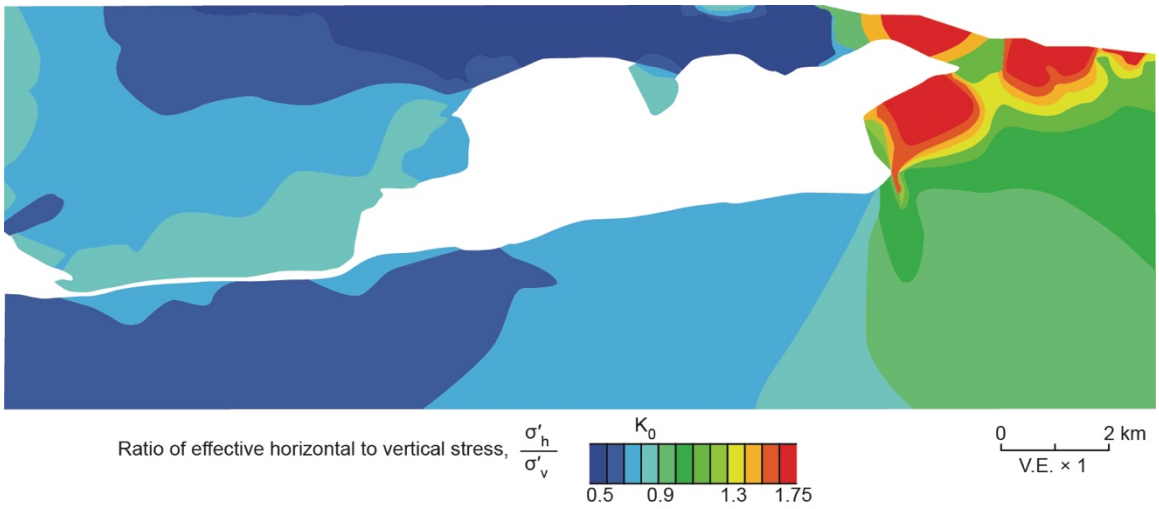


Fig 2: Pressure prediction along well 782-1 with MDT pressure measurements. The FES approach closely predicts measured pressures below salt whereas both the VES and MES approaches under-predict pressure.



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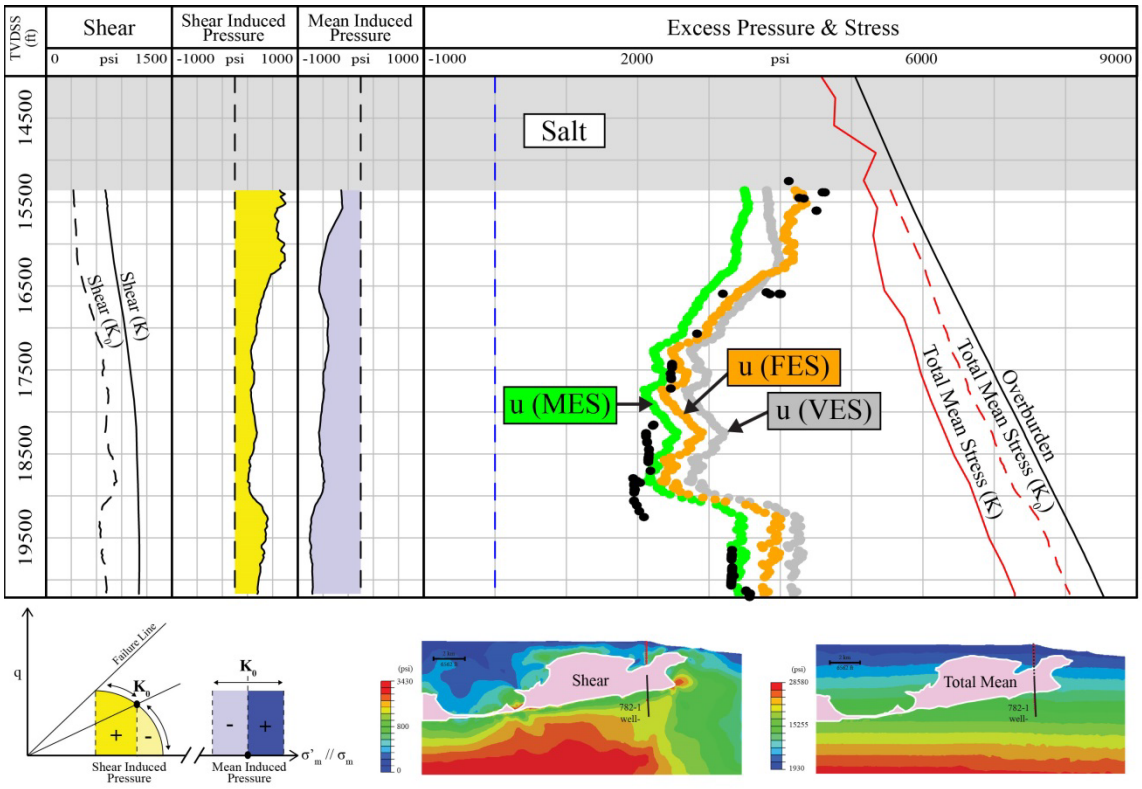
Back



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Back