13.05: Prediction of pore pressure and the full stress tensor over a seismic volume in the Gulf of Mexico using 3D FES model

Mahdi Heidari, Research Associate

ABSTRACT

We use the FES method along with a 3D geomechanical model to predict pore pressure and the full stress tensor from seismic velocities over a seismic volume in the deepwater Gulf of Mexico. The volume includes complex salt bodies, an extensive sand bed, mudrocks, and two control wells, where log data and pore pressure measurements are available (Fig. 1). In the geomechanical model, salt bodies are delineated based on their velocity, the sand bed is delineated based on seismic interpretations, and the sand bed and mudrocks have different mechanical properties; overpressure is obtained from their velocity in mudrocks but is assumed to be uniform across the sand bed and equal to the value measured at the control wells, assuming the sand bed is hydraulically connected across the volume. We predict that overpressure and least principal stress drop significantly in the sand bed. Furthermore, the FES method predicts significantly higher least principal stress than the standard VES method near a salt stock and thus a larger drilling window near the stock (Fig. 2), because the FES method considers the high lateral push from the stock due to salt relaxation.

CLICK ON IMAGE FOR LARGER VIEW

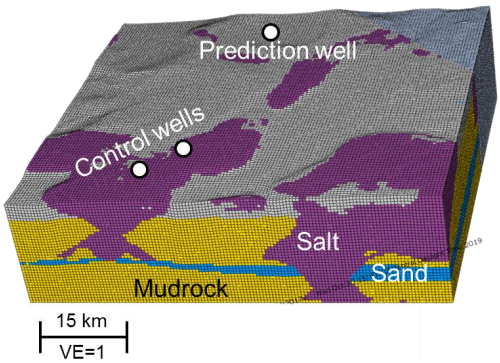

Figure 1: 3D geomechanical model used in FES method.

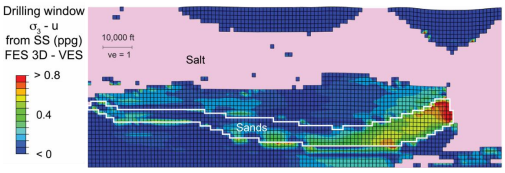

Figure 2: Difference between drilling windows predicted by the FES and VES methods.

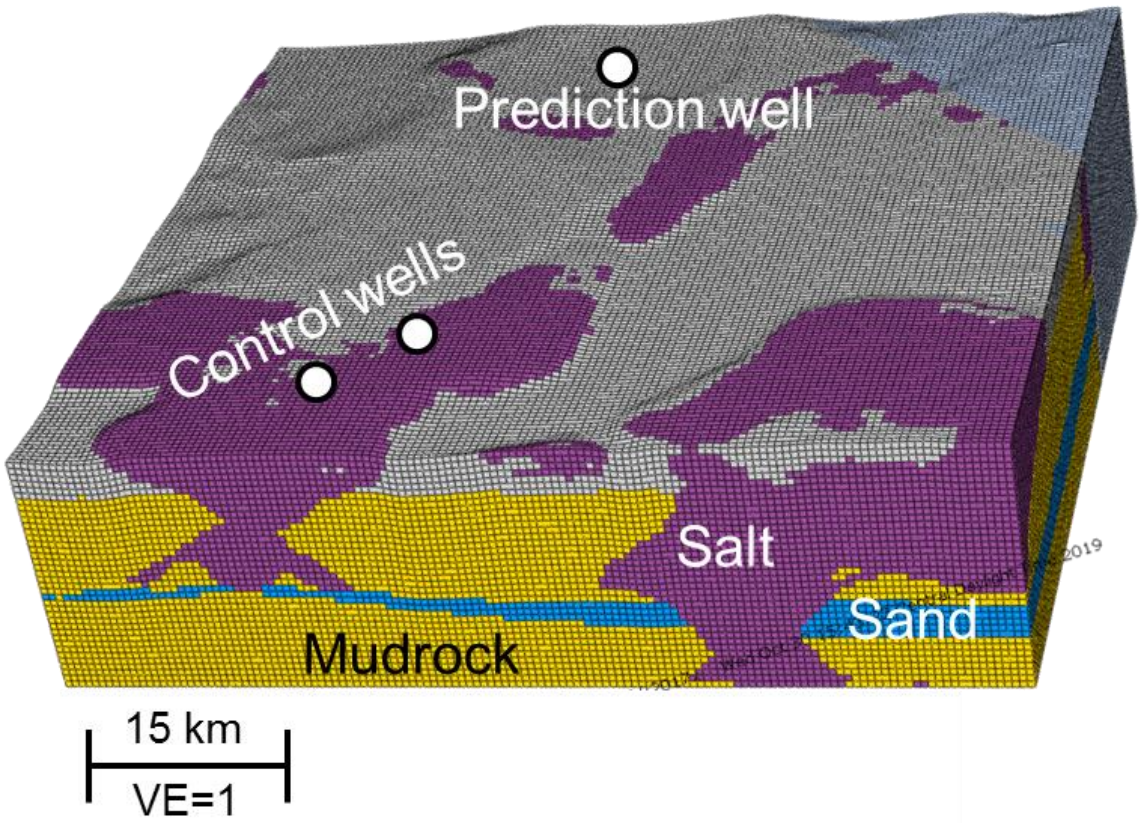

Figure 1: 3D geomechanical model used in FES method.

Back

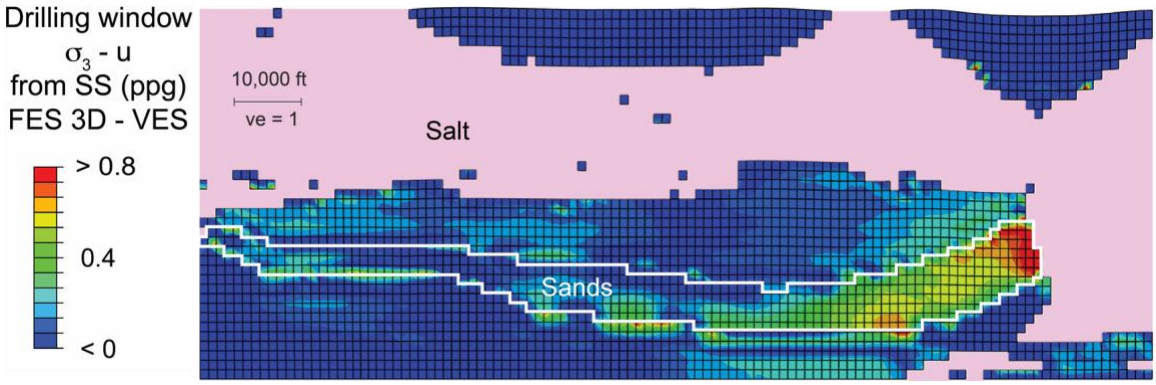

Figure 2: Difference between drilling windows predicted by the FES and VES methods.

Back