12.02: 3D Mad Dog Pressure and Stress Prediction using the FES Method in Horizon (Elfen)

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ABSTRACT

We use a 3D case study at the Mad Dog field to demonstrate a streamlined workflow that integrates seismic velocity and complex 3D geomechanical modeling to predict pressure and stress. We apply the Mean Effective Stress (MES) and Full Effective Stress (FES) approach and couple a 3D static geomechanical model of Mad-Dog (Fig. 1) with a wide azimuth velocity cube, both provided by BP. We identify areas where the mean and/or shear components of overpressure are significant. Furthermore, we show that the velocity-informed geomechanical model is able to predict the pore pressure regression observed at Mad Dog (Fig. 2) and the regional hydraulic connectivity in the area. The 3D geomechanical model is built in Horizon (Elfen). Modified Cam Clay is used to describe the form of iso-porosity contours. Initial pore pressures are initialized using the VES pressure estimate. The workflow converges in 3 iterations.

CLICK ON IMAGE FOR LARGER VIEW

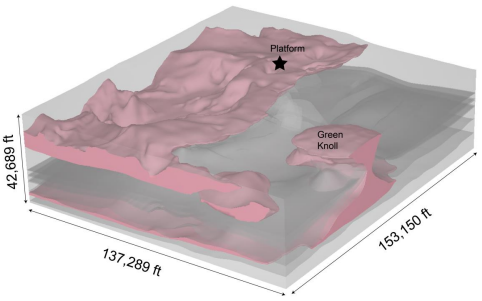


Figure 1: 3D geomechanical model of Mad Dog built in Horizon (Elfen). The mesh consists of approximately 28 million elements, with an average size of 250ft. Layers represent salt (pink), sand, mudrock, and carbonate lithologies.

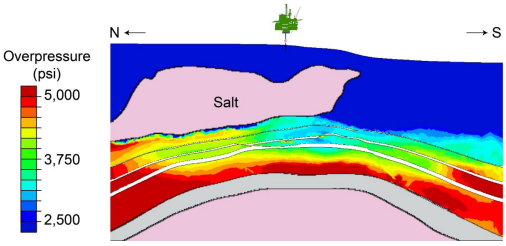
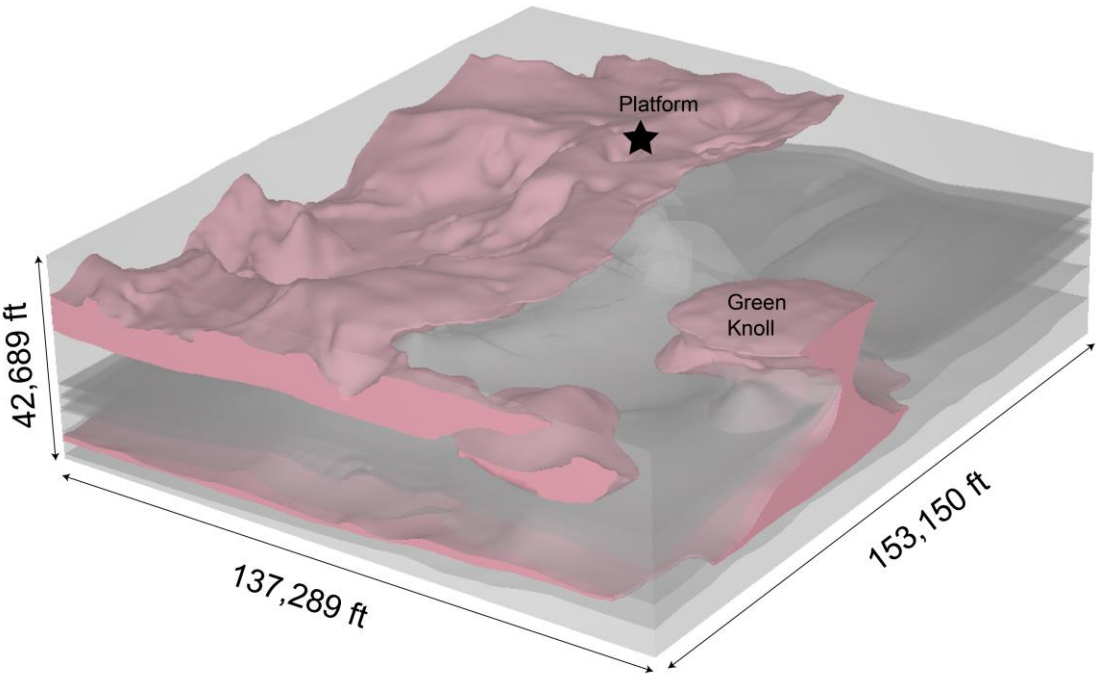


Figure 2: FES overpressure prediction along a North-South transect of Mad Dog including the initial platform location. The velocity-informed prediction captures the observed pressure regression.



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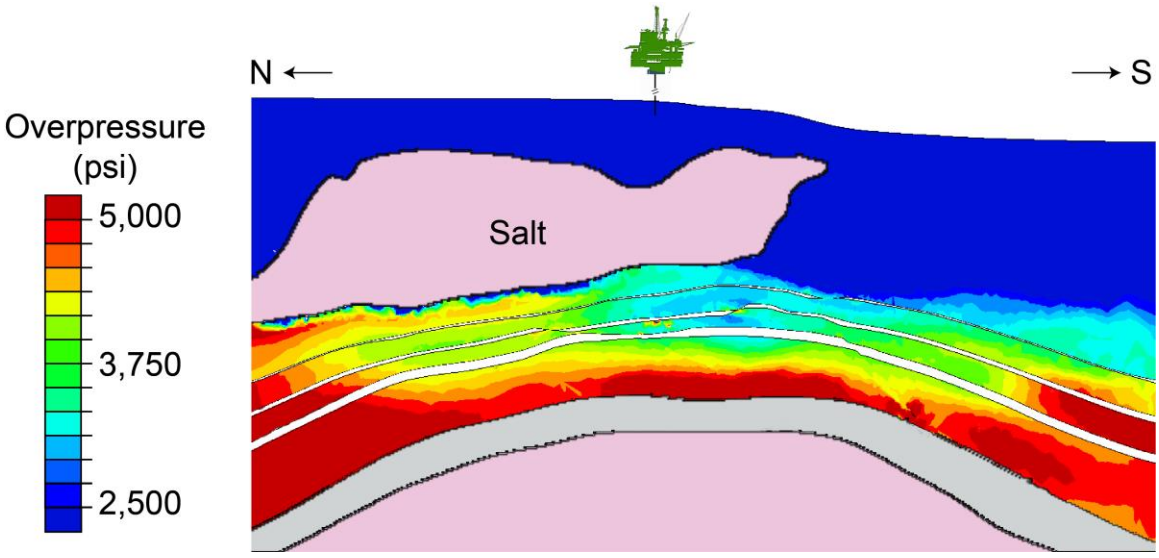

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