Evaluation of FES seismic-based workflow for pore pressure prediction

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ABSTRACT

We evaluate the FES seismic-based pressure prediction workflow using results from an evolutionary transient geomechanical model (Fig. 1). The geomechanical model provides prediction of the full stress tensor and pore pressure at any given time of the system evolution. We consider model time of 56m.y.–which marks the end of salt-sheet emplacement–as present-day. We extract porosity at the basin nodal grid and calculate equivalent seismic velocity values (Fig. 1). We then build a static, present-day model and apply the 3 pressure prediction workflows: VES (based on vertical effective stress); MES (based on mean stress) and FES (based on the full stress tensor). We use the calculated velocities as seismic data and compare the workflow predictions with the pore pressure provided by the evolutionary model. We find that the FES prediction is closer to the actual pressure field, especially in the central part of the basin and near the welded pedestal (higher mean and shear stress). We discuss our recent efforts to streamline the prediction process, especially the new implementation of the FES workflow as a tool in Horizon/Elfen software.

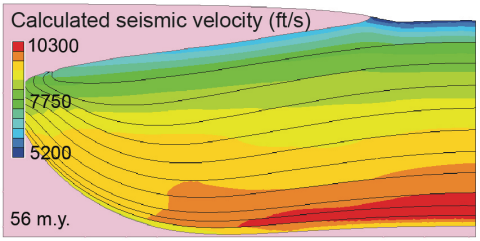


Figure 1: Evolutionary transient geomechanical model of salt-sheet emplacement at 56m.y. Contours plot seismic velocity calculated from model porosity (Nikolinakou et al., 2018; JMPG)

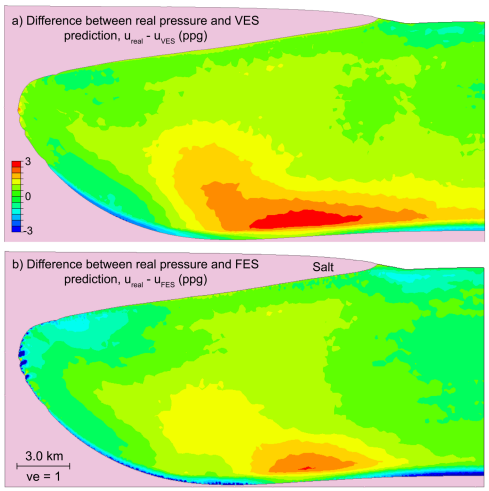
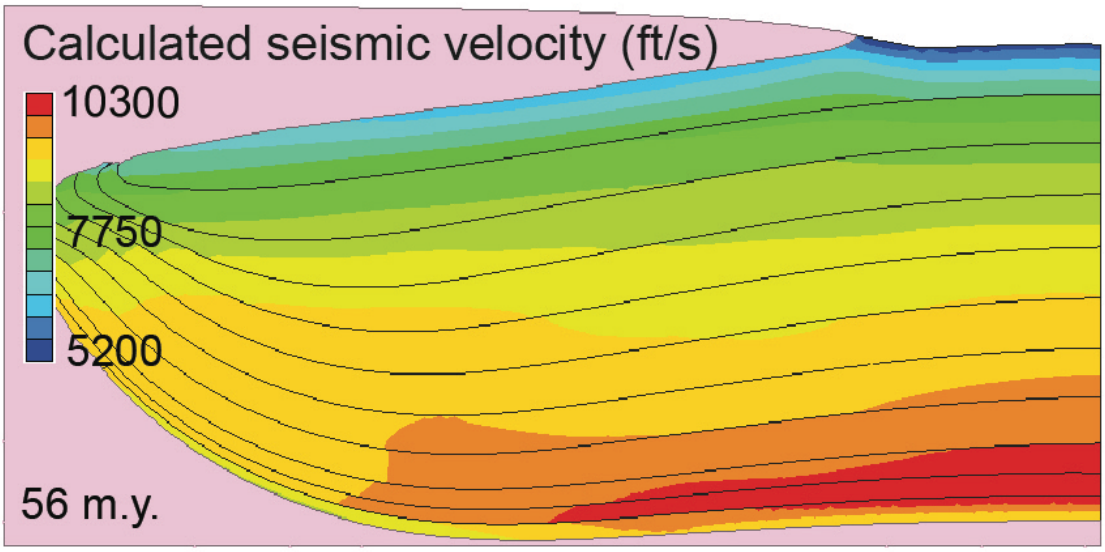


Figure 2: Difference between a) basin pressure and VES prediction and b) basin pressure and FES prediction, in equivalent mudweights (ppg). Warm colors indicate areas where the corresponding method underpredicts pressure.



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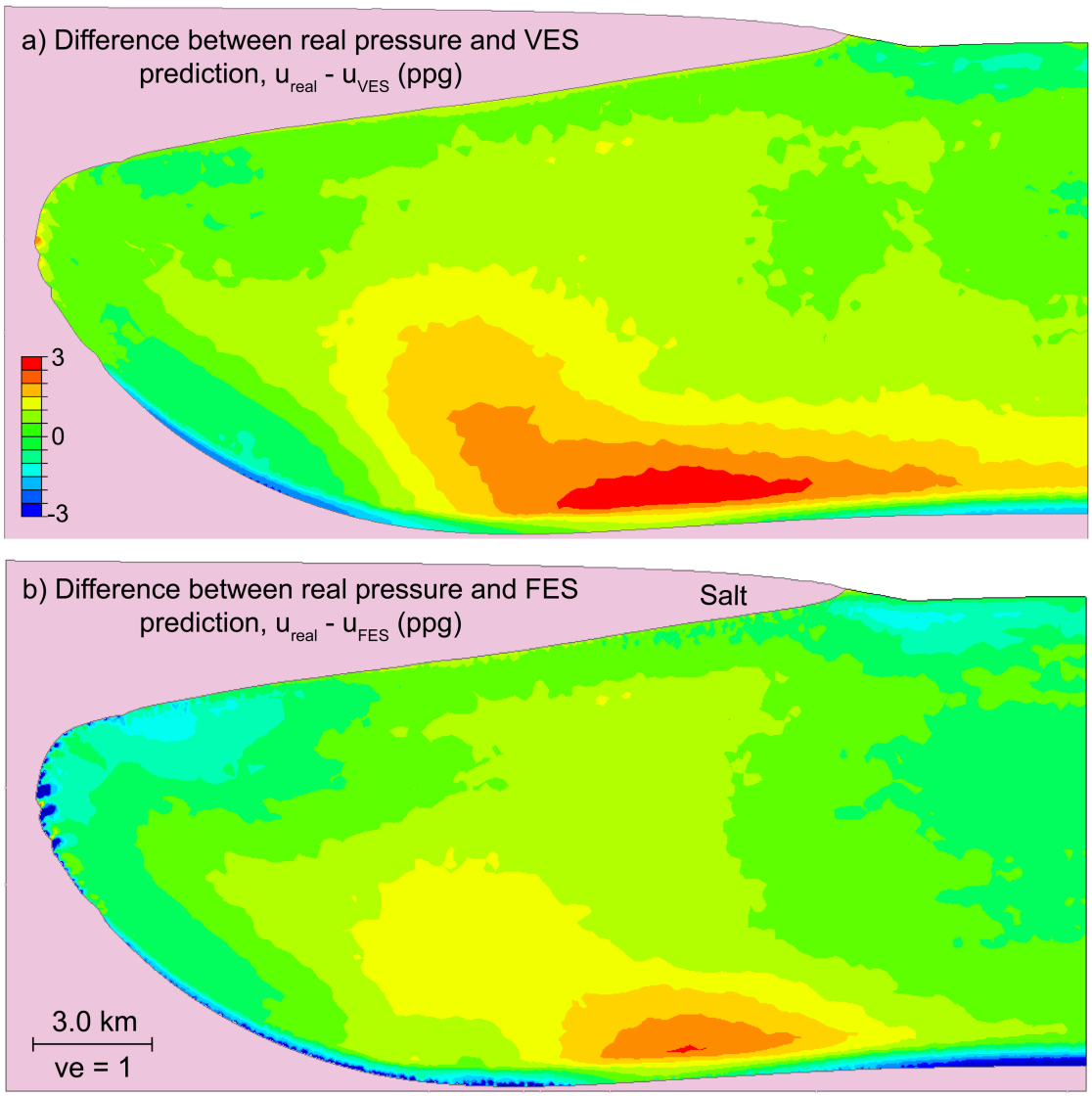

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