08.19: 2D or 3D geomechanical modeling? A case study from the West African Coast

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ABSTRACT

We show that carefully selected 2D geomechanical model can represent more complex 3D geometries. A 3D geomechanical model of a field located at the West African Coast is compared against a 2D plane strain model. The 2D model section is obtained from the 3D geometry to represent key features of the field and the fault above salt. Both 3D and 2D models predict unloading above salt and a decrease of the least principal stress, having extension in the sediments located at the crest of the salt. Both models show similar deformation patterns, having the 2D model higher magnitudes (Fig. 1). In addition, the 2D model allows to better understand the mechanisms that leads to stress/strain changes. The presence of the fault added to the seafloor slope and the salt geometry lead to extension above salt (Fig. 2). Overall, we demonstrate that carefully built 2D models can provide useful information at the exploration stage.

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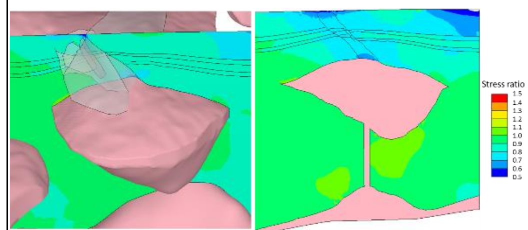

3D **2D**

Fig 1: Comparison of horizontal to vertical stress ratio predicted by a 3D (left) and 2D (right) model. Both models predict a decrease in horizontal stress above salt, being higher in magnitude the one observed in the 2D model.

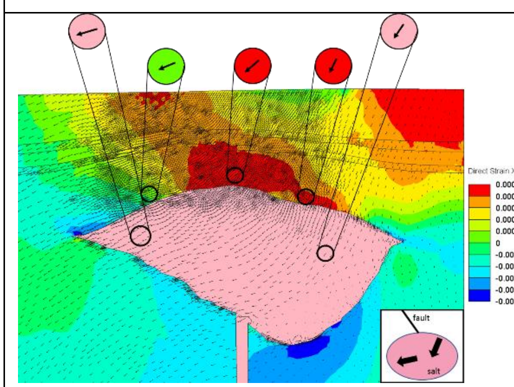

Fig 2: Contours and arrows showing magnitude and direction of horizontal strains in and around salt. Extensional strains develop above salt because of the salt deformation combined with the presence of the fault. These extensional strains lead to the decrease in horizontal stress (Fig. 1).

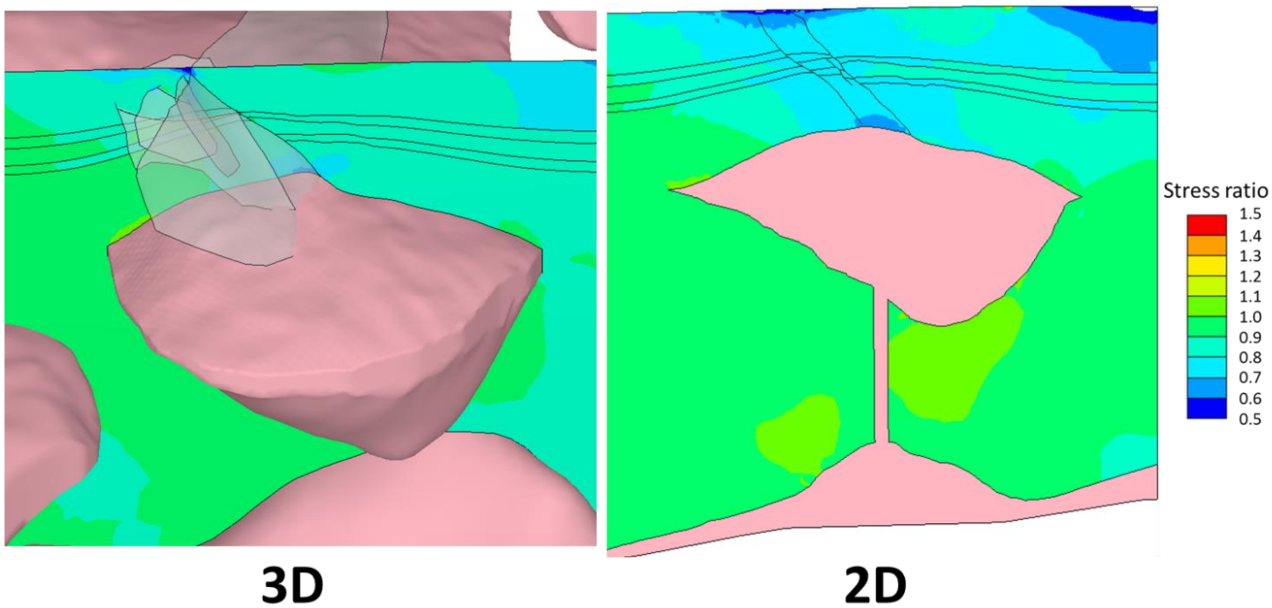

Fig. 1: Comparison of horizontal to vertical stress ratio predicted by a 3D (left) and 2D (right) model. Both models predict a decrease in horizontal stress above salt, being higher in magnitude the one observed in the 2D model.

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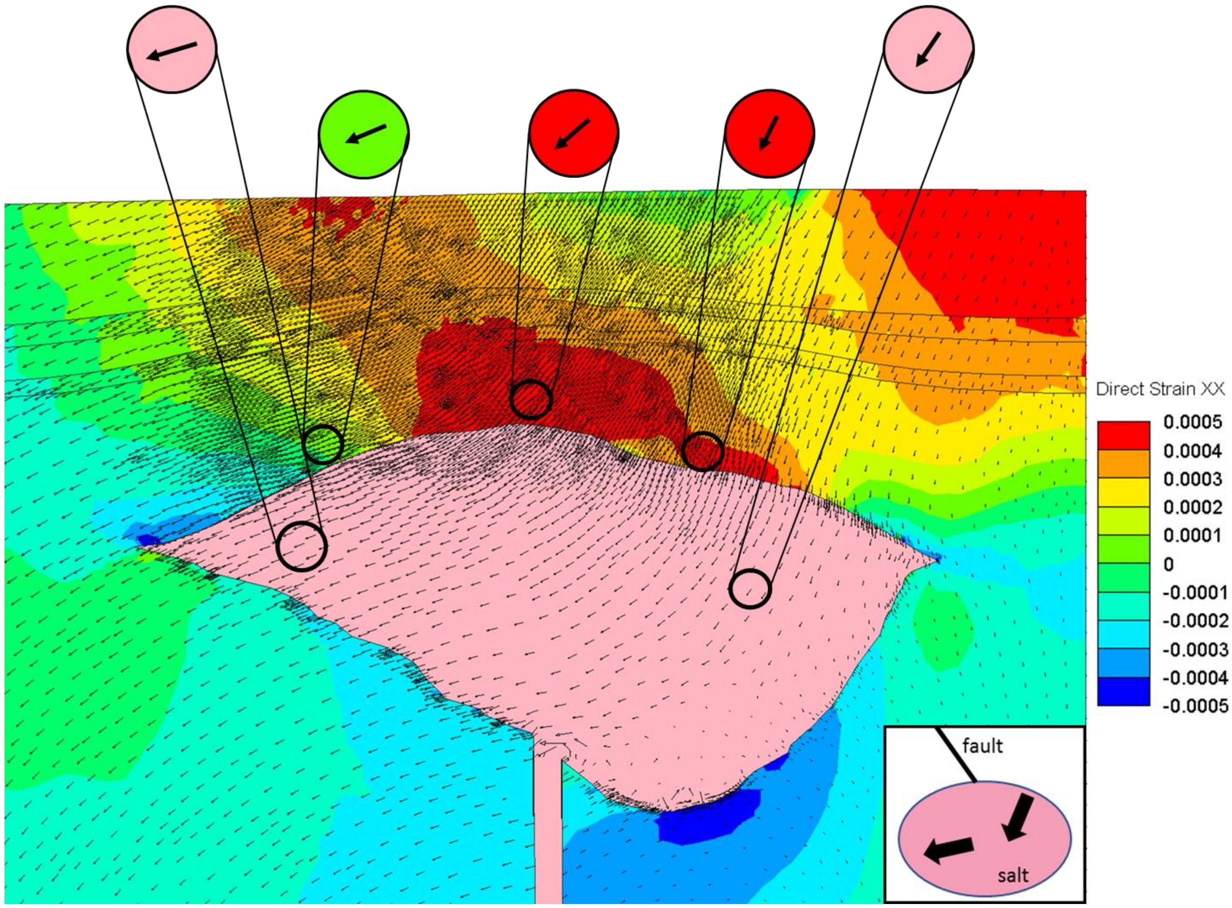

Fig. 2: Contours and arrows showing magnitude and direction of horizontal strains in and around salt. Extensional strains develop above salt because of the salt deformation combined with the presence of the fault. These extensional strains lead to the decrease in horizontal stress (Fig. 1).

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