10.12: Incorporation of sequential restoration into evolutionary geomechanical modelling

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ABSTRACT

We use sequential restoration (Figure 1) to inform a 2D geomechanical evolutionary model of the Tarfaya salt basin located at the West African Coast. From the restoration, we define the initial salt and basement geometry and the sedimentation rate of each depositional horizon. The salt flow in the geomechanical model is not kinematically predefined. Instead, differential loading by sediment results in salt flow that forms diapirs and deforms the evolving stratigraphy. We build our models with Elfen. We model salt as a solid viscoplastic material and sediments as poro-elastoplastic. Our evolutionary geomechanical model illuminates the evolution of stress and deformation during the basin formation (Fig. 2).

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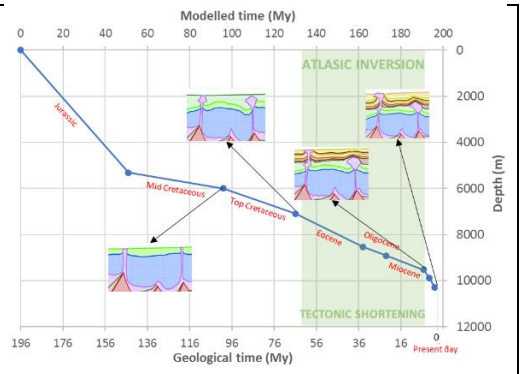


Fig 1: Burial history of the Tarfaya basin deduced from sequential restoration (blue line). Insets illustrate the target geometry of the basin (including salt diapirs) at the marked burial times. The green region represents the interpreted period of tectonic compression.

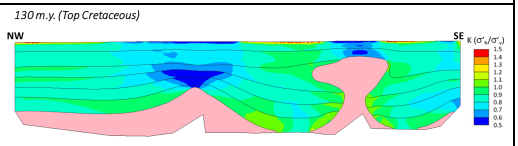
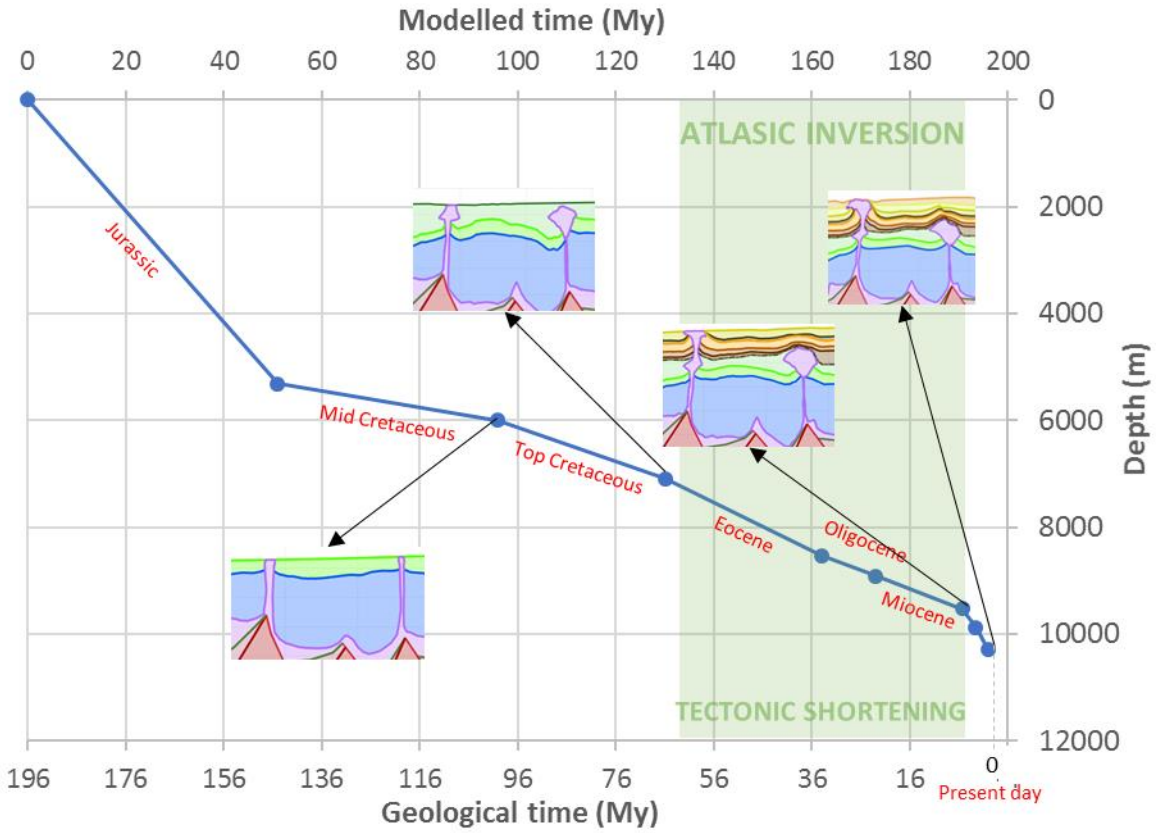


Fig 2: Geomechanical model results at final Cretaceous (130 m.y. of modelling time). Salt material (pink volume) generating a salt diapir at the SE. Colour contours show the stress ratio distribution in the sediments (being 0.8 the uniaxial stress ratio K0), indicating extensional regime above salt diapirs (dark blue contours) and a more isostatic stress regime near the salt stems (green contours).



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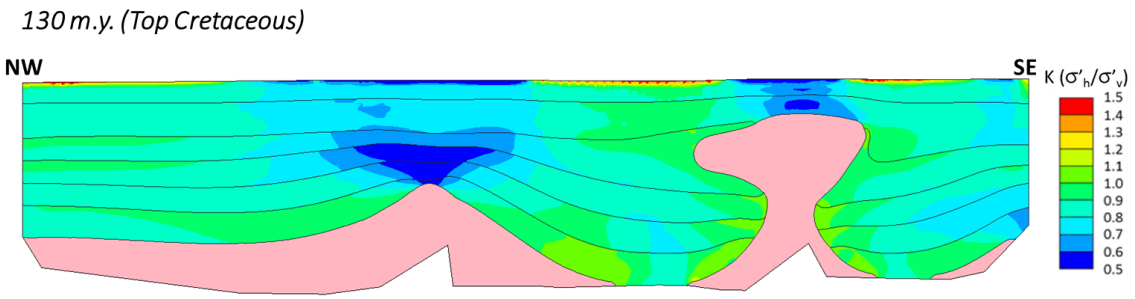

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