# 11.22: Reconstruction of a salt diapir evolution using geomechanical modelling and sequential restoration

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## ABSTRACT

We use data from a sequential restoration to model the evolution of a salt diapir located in the Tarfaya basin, NW African Coast, using a 2D geomechanical forward model. We define the deposition horizons using the sedimentation rate provided by the restoration model for each geologic period (Fig. 1). We also apply regional shortening during the second half of the model to simulate the Atlas inversion. We show that the rate of deposition is a key control on the geometry evolution of the salt system. Shortening plays a significant role in re-activating diapir rise. The available salt volume also affects the diapir's ability to upbuild to the surface (Fig. 2). On the other hand, changes in basal geometry and temperature gradient do not have a significant impact on the final diapir geometry. We model sediments as poro-elastoplastic material and couple sedimentation with salt flow and regional shortening to determine the sediment porosity and strength.

**CLICK ON IMAGE FOR LARGER VIEW**

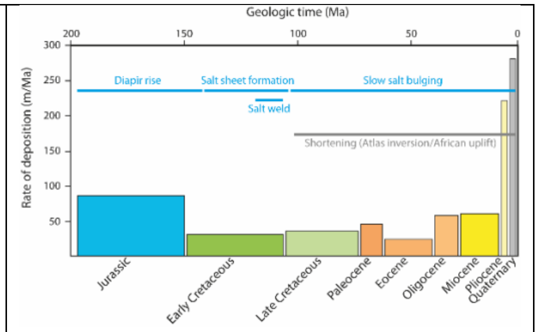



**Fig 1:** Sedimentation rates for each geologic period extracted from a sequential restoration model and applied into the forward Elfen model. Each bar thickness is proportional to the duration of the period it represents. The blue horizontal bars illustrate the main stages of the salt system evolution and the grey bar denotes the shortening duration.

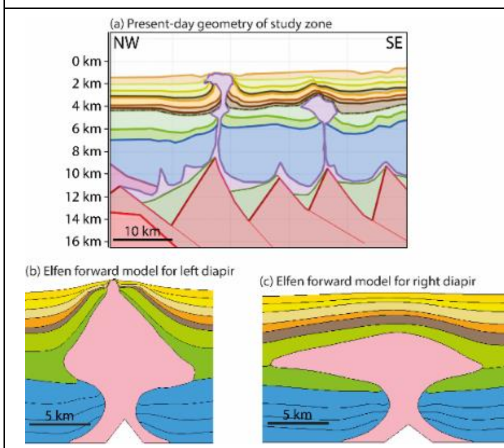
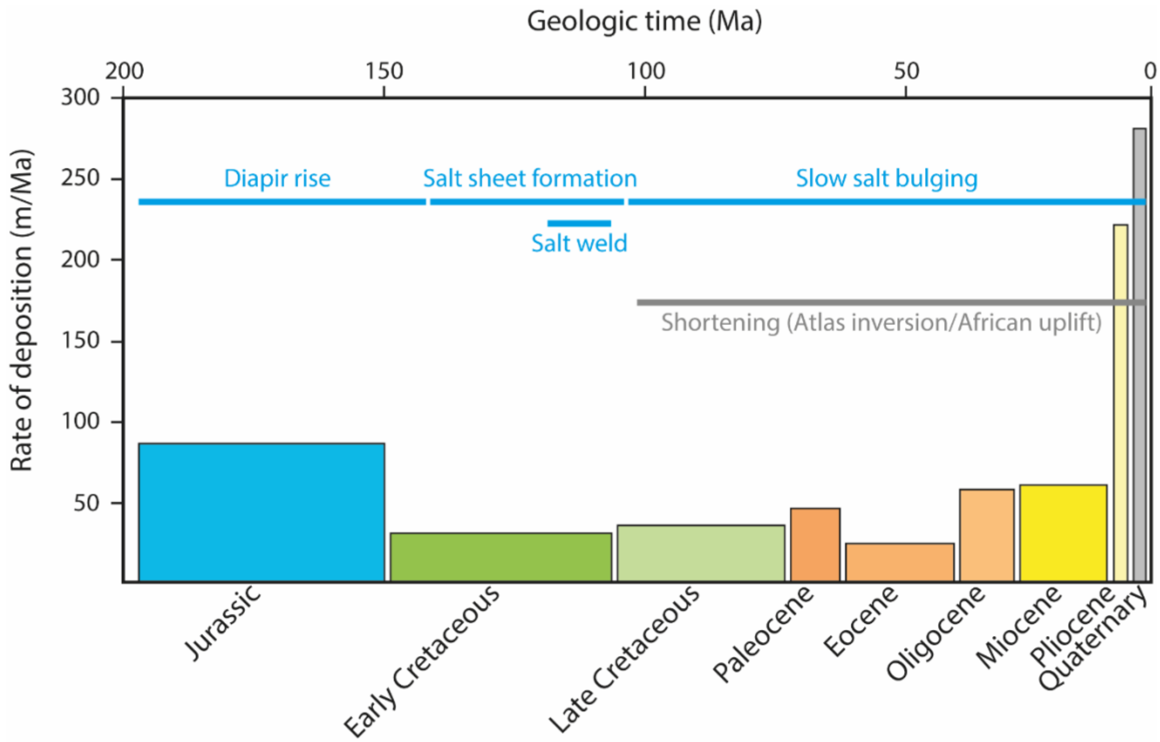



**Fig 2:** (a) Present-day geometry of the Tarfaya basin showing a buried diapir at the SE and a diapir reaching surface at the NW. These diapirs are forward modelled in Elfen obtaining a diapir reaching the surface (b) that starts with a thick salt source layer and another diapir getting buried (c) that starts with a thinner salt source layer and lower sedimentation rates (Fig. 1).

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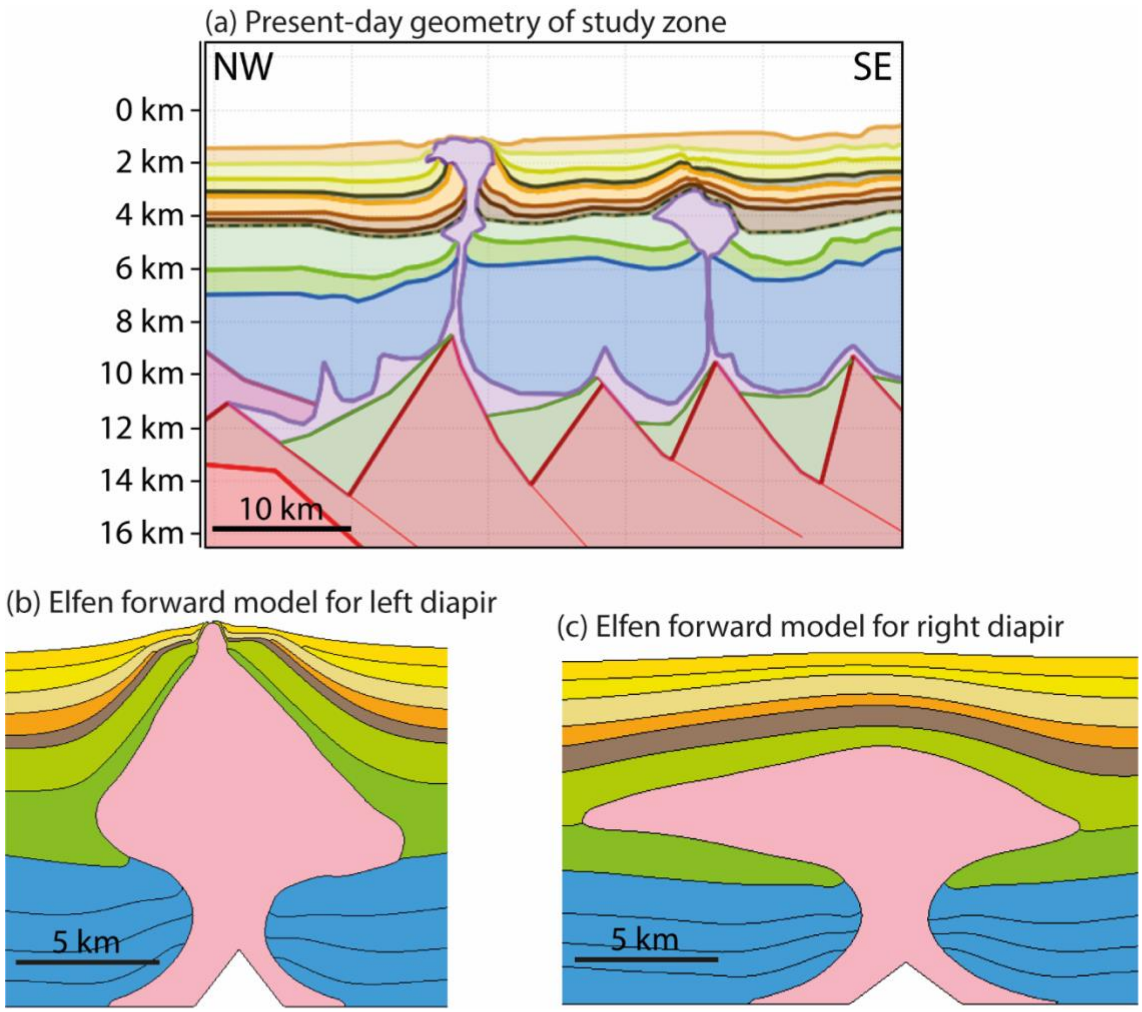


**Fig. 2**: (a) Present-day geometry of the Tarfaya basin showing a buried diapir at the SE (Sandia diapir) and a diapir reaching surface at the NW. In evolutionary geomechanical models, the use of sedimentation rates from the SE end of the basin (Fig. 1) yields a geometry comparable to Sandia (c), whereas increased sedimentation rates and thicker source layer (both characteristic of the NW basin end) lead to a diapir that reached the surface (b).

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