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Influence of pre-existing salt structures in the 3D pattern of multilayer folding

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Upward movement of the Precambrian Hormuz salt in the Fars region of the Zagros is supposed to have started as early as Late Cretaceous. The Late Cretaceous – Tertiary deformation events that lead to the folding of the sedimentary cover in this area would have therefore, enhance the upward salt movement by squeezing the pre-existing salt structures. How these salt diapirs evolve under such compressive events has already been previously addressed using analogue models (e.g. Callot et al. 2012). The same authors observed that pre-existing salt structures control the size and geometry of folds in sandbox models.

Our previous work has shown that 3D folding instability gives rise to a wide variety of fold shapes (e.g. from dome shape structures to long en echelon or straight anticlines), resulting of the interactions between growing fold segments. The three dimensional growth of these folds, the wavelength and the lateral propagation, is itself controlled by physical parameters. However, the existence of initial weak zones such as pre-existing salt plugs within the sedimentary cover can affect the development of such folds by localizing part of the deformation.

In this study we have used numerical modeling to investigate how the fold pattern in 3D multilayer folding is affected by pre-existing salt structures. High-resolution 3D folding simulations (with and without pre-existing salt structures) were performed with the parallel code LaMEM. Cylindrically shaped diapirs with different diameters and heights have been added to a multilayer folding setup. The use of a finite element based landscape evolution model (both erosion and sedimentation) allows for initially buried salt diapirs to be exposed at the surface during folding evolution.

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References

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