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Do surface processes and/or the presence of an initial surface topography affect(s) the fold linkage?

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Landscape geomorphology provides an indirect observation of the tectonic activity. Surface processes and tectonics interact one with another to create a wide variety of landscape. Geomorphic features such as wind gaps can record the amplification and lateral propagation of embryonic fold segments. Depending of their relative initial spacing, those growing fold segments can link and form long train folds. This mechanism has been suggested for the Zagros Folded Belt, where the axial lengths of folds can reach more than 100 km.

Previous studies have focused on fold linkage or on the response of the drainage network to tectonic forcing. Using seeds in their setup to prescribe the fold orientation, Grasemann and Schmalholz (2012) numerically investigated the distance between two isolated laterally propagating folds to explain the different modes of linkage. However, the effects of surface processes on the fold development have not been considered.

Our recent multilayer folding experiments, in which an initial random perturbation was prescribed, have shown that under efficient drainage network conditions, or when a non-zero initial topography was applied to the model, the type of fold linkage could be modified. In this study we systematically investigate the effects of surface processes on the mode of linkage and how the distance between two isolated growing perturbations, required for linkage, is affected.

In order to address this question, we use the 3D thermo-mechanical code LaMEM, which has been coupled to a finite-element based landscape evolution model (both erosion and sedimentation). The landscape evolution model uses a non-linear diffusion formulation (Simpson and Schlunegger, 2003) taking into account both hillslopes and channel processes.

Graseman, B., and Schmalholz, S. M., 2012, Lateral fold growth and fold linkage: Geology, v. 40.
Simpson, G., and Schlunegger, F., 2003, Topographic evolution and morphology of surfaces evolving in repsonse to coupled fluvial and hillslope sediment transport: Journal of geophysical research, v. 108, p. 16p.