

Interactive comment on “Stress field sensitivity analysis in a sedimentary sequence of the Alpine foreland, Northern Switzerland” by T. Hergert et al.

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General comments

This is a clearly written and structured paper in which the effects of variations in rock mechanical properties on the magnitude of the local stress field are assessed using a 3D finite element model of a study area in Switzerland. The study includes both vertical and vertical variations in rock properties. The vertical variations arise from the sedimentary layering, whereas horizontal variations are the result from considerable offset along several major faults. The numerical model has sufficient resolution, and boundary and loading conditions are appropriate, taking into account the conditions valid for the study area. The presented results clearly show the importance of variations in rock properties (“heterogeneity”) on the magnitude of several stress parameters. The

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sedimentary controlled “vertical” variations typically affect the regional stress field, and as such may affect the response of the study area to other long-term thermal and mechanical loading. Changes in stress caused by fault induced “horizontal” variations in properties are of similar magnitude, however remain very local.

Specific comments

1) At the beginning of section 2.5.3 the authors describe that in order to incorporate the far-field tectonic stresses, a horizontal displacement boundary condition is applied to the model. It seems more logical to apply a horizontal stress boundary condition, in particular since available stress magnitude data from the Benken borehole is considered by the authors as “a good proxy” for the regional far field stress. Authors should comment on this, and explain their choice of boundary condition.

2) When subjected only to the initial stress loading both the SA and SIA faults already produce local stress perturbations (e.g. Fig.9c), suggesting the occurrence of some fault slip. The authors should discuss if and to what extent these initial strains influence the modelling results for the subsequent tectonic loading.

Interactive comment on Solid Earth Discuss., 7, 711, 2015.