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Solid Earth Discussions

Interactive comment on "A multi-stage 3D stress field modelling approach exemplified in the Bavarian Molasse Basin" *by* Moritz O. Ziegler et al.

Anonymous Referee #2

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This is a very nice contribution that brings a new methodology of extrapolating and understanding the stress field distribution obtained from widely distributed and unevenly spaced data towards the resolution required by the exploration industry. Although the individual components rely mostly on known methodological approaches, their combination is indeed novel and highly interesting. I agree with the authors that such an approach has multiple applications, in particular for geoengineering and geothermal exploration. I see only a few concerns on the general approach of such a methodology that can, potentially, be better discussed in the manuscript: (1) the resolution of the input geological model is given as granted and no feedback between the modelling inferences and the distribution of stratigraphy and faults geometry. Such a modelling approach should contain feedbacks to known fault kinematic behaviour that may correct and improve the reliability of the modelled predictions. Inspecting the overall

geological input model shows that the resolution is coarser that the density of even the root model in many areas. I advise the authors to discuss more the role of the local geological distribution of faults into the modelling results and the rather underestimated impact of (strain) partitioning along the large structural lineaments. This is quite vaguely discussed. I furthermore agree with previous reviewers that the investigation depth is somehow limited given the much deeper extent of the overall process driving the present-day stress distribution; (2) the overall world stress data work very well to regional estimates of the state of stress, but their reliability significantly decreases at higher resolution due to partitioning and local distribution effects. Although the stress data distribution appear simple in the study area, it would be good to have a discussion in a resolution analysis applied to the modelling results; (3) the elastic approach considered is somehow limited given the wide diversity of observed scenarios for instance controlling strain weakening and strain hardening in fault (re)activations, generally derived by experimental studies and tested by observations, e.g. in areas affected by induced or triggered seismicity. It would be good to have a better discussion of the link between the model and such a variability of deformation mechanics.

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