Solid Earth Discussions

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Comment on se-2021-95

Jonas Kley (Referee)

Referee comment on "Variscan structures and their control on latest to post-Variscan basin architecture: insights from the westernmost Bohemian Massif and southeastern Germany" by Hamed Fazlikhani et al., Solid Earth Discuss., https://doi.org/10.5194/se-2021-95-RC2, 2021

Dear Hamed Fazlikhani and co-authors,

this is a highly interesting and welcome contribution presenting new seismic data and interpretations from the Franconian basin. I particularly enjoyed the careful documentation of your interpretation criteria and the beautiful interpreted seismic profiles. Congratulations! The number of seismic lines acquired in the German uplands (Mittelgebirge) region is very limited and most of the existing ones were aimed at deep structures (e.g. DEKORP) and do not image shallower features well, so the new FRANKEN survey is a first step in closing a knowledge gap.

I have inserted comments in the uploaded annotated version of your manuscript. The only major points where I see room for improvement are the following:

- It would be helpful to have a map of the boreholes that encountered Rotliegend with thicknesses and interpreted subbasins. The text with all this information is a bit cumbersome to read.
- You should elaborate somewhat on the interpreted relationship of the Variscan shear zone(s) and younger faults. With the main shear zone being very gently dipping and undulating, it is not easy to understand how it determines the locations and orientations of relatively steep faults or what “away from the shear zone” means for such geometries.
- You don´t make a very explicit argument as to why younger reverse faults tend to splay from more strongly inclined segments of the shear zones. I assume this is due to the shear zones approaching the orientation of an ideal newly formed thrust fault. If that is what you think, you could say so more clearly.
- An intriguing structural detail in your interpretations is that SW-dipping Rotliegend

normal faults do not become reactivated as reverse faults but still somehow manage to localize the very probably Late Cretaceous NE-dipping reverse faults. The new faults almost invariably pass through the tips of the older normal faults located near the base Buntsandstein. Any idea how this can be explained mechanically? My first intuition would be to expect the basement shoulder bordering a Rotliegend basin to become chopped off and thrust over the basin fill. In that case, however, the new reverse fault would carry a bit of basin and the decapitated old normal fault in its hanging-wall. I don´t know whether it is possible to come up with a good explanation, but you might acknowledge this as an enigmatic feature.

- In Figs. 6 to 9, the lowermost panels showing your profiles in depth domain and without vertical exaggeration exhibit some inconsistencies with respect to the detailed seismic interpretation (mostly thicknesses and thickness trends) and loss of structural detail that is not enforced by the scale of the illustrations. I have marked some of the inconsistencies in the pdf. It looks like you have done the interpretation again. I would recommend to transfer the more detailed interpretation in time domain to the depth domain profiles and adjust their geometries. I assume you have done so with the line drawings, anyway.

I am looking forward to seeing a revised version published!

Jonas

Please also note the supplement to this comment:
https://se.copernicus.org/preprints/se-2021-95/se-2021-95-RC2-supplement.pdf