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Reply on RC1

Piotr Krzywiec et al.

Author comment on "Together but separate: decoupled Variscan (late Carboniferous) and Alpine (Late Cretaceous–Paleogene) inversion tectonics in NW Poland" by Piotr Krzywiec et al., Solid Earth Discuss., <https://doi.org/10.5194/se-2021-105-AC1>, 2021

Response to the comments made by Gabor Tari (reviewer 1)

Dear Gabor,

We highly appreciate all the comments you provided regarding our paper on inversion tectonics in NW Poland. Here is our response to your three general comments:

- Indeed, one of the key points of our paper is description and analysis of thin-skinned inversion scenarios, without involvement of the crystalline basement. In order to better describe and illustrate this, Fig. 1 was modified so it now also includes a model for master fault detached in evaporites as such scenario is reflected in our own data; additionally, relevant part of the text has been expanded.
- Discussion on negative versus positive inversion has been expanded to better clarify our opinion that the term inversion should be rather restricted to the "classic" scenario proposed by Bally (and clearly described in your own paper from this volume). This is also in agreement with remarks made by Mark Cooper in his review of our paper. Additionally, we checked several textbooks and key papers (but not all, of course, so we might have missed something ...) and haven't found definition of "fault reactivation" suggesting that reactivation implies renewed activity in the same kinematic sense; we think that "reactivation" means just renewed activity, in the same or opposite kinematic sense: normal fault could be reactivated as normal or reverse / thrust fault, and vice versa, reverse / thrust fault could be reactivated as reverse / thrust or normal fault. Actually, very good illustration of reactivation of thrusts during normal faulting (i.e. in opposite kinematic sense) is shown in Fig. 2 in your very interesting recently published paper on the Miocene extension within the Alpine – Carpathian junction area (*Tari et al. 2021, The connection between the Alps and the Carpathians beneath the Pannonian Basin: Selective reactivation of Alpine nappe contacts during Miocene extension. Global and Planetary Change, <https://doi.org/10.1016/j.gloplacha.2020.103401>*).
- We indeed just speculate about extensional reactivation of Caledonian thrusts being responsible for formation of half-grabens recently imaged by 3D seismics in NW Poland beneath the Zechstein evaporitic cover as much deeper high-quality seismic imaging, comparable to the results of e.g. PolandSPAN survey, would be required in order to map master faults at greater depths and to actually see their relationship to the Caledonian FTB. In the text we cited several papers that document late Paleozoic extensional reactivation of Caledonian thrusts and formation of extensional grabens (Braathen et al., 2002; Fossen, 2010; Koehl et al., 2018; Rowan and Jarvie, 2020;

Séranne et al., 1989; Stemmerik, 2000). Additionally, Lassen et al. (2001), also cited in our paper, has an example from “our” part of Europe that is based on seismic data (although not of the highest quality). We think that these examples together with high-quality seismic image of the most frontal part of the Caledonian FTB provided by the regional high-end PolandSPAN survey that was used to construct our Fig. 9 provide enough basis for our speculations. Of course, other possibilities could not be definitely ruled out; hopefully in the future new deep seismic data would provide final answer to this problem.

You detailed comments in the annotated pdf file with our paper were mostly of technical character and have been considered while working on the revised version of our manuscript.

Here is our response to your suggestions regarding modifications of some of the figures:

Fig. 1: thick-skinned and thin-skinned descriptors added in the figure caption

Fig. 2: coastline added to the legend

Fig. 3: vertical scale annotated in TWT

Fig. 7: we tried to use different color displays for seismic data but end of the day we think that grey scale version provides best results, especially for panel C, so this figure hasn't been modified.

Fig. 8: this figure was designed for one full page so removal of particular panels would not be in our opinion advisable; panel (k) was amended as suggested

Fig. 9: color of the basement was changes as suggested

Fig. 11: information about equal scales for both seismic examples was added to the text

Again, many thanks for your review. We hope to continue discussion on various aspects of inversion tectonics in the future.