

Interactive comment on “Late Cretaceous to Paleogene exhumation in Central Europe – localized inversion vs. large-scale domal uplift” by Hilmar von Eynatten et al.

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Received and published: 16 February 2021

Response to Reviewer-2:

- I believe that this manuscript is very timely in view of current efforts in understanding large-scale exhumation of large continental areas, particularly in the light of current discussions on dynamic topography effects. I appreciate the solid-written and argued character of the manuscript, the documentation by detailed and state-of-the-art thermochronology and the nice discussion on genetic mechanisms. I suggest that the manuscript can be accepted almost as is.

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Thank you for the positive evaluation.

- What can be improved is a better link between the various genetic mechanisms discussed and a preferred solution. The validity of some of these mechanisms is not really fully clear in the manuscript. For instance, I would see lithospheric folding as a fairly suitable mechanism providing an advanced explanation. However, the authors discard this mechanism because "a region that was subsiding until the onset of inversion will not become uplifted but exhibit accelerated subsidence under tangential compression", which is an unclear argument. This is either not well explained or incorrect: sure that subsidence may be enhanced by lithospheric folding in basins, we see such effects in many worldwide places. In a similar way, other potential mechanisms are not fully clear in the manuscript, at least to me. Therefore, to increase the impact of the paper, I suggest to revise, explain better and be more quantitative to all mechanisms explained in Section 7. Otherwise, as said above, this is a very nice contribution that fits perfectly the scope of the journal.

Yes, we agree that a well-elaborated solution that fully explains our findings would be desirable. Given the length and scope of the paper as presented now, we decided to discuss first-order estimates of some (more or less) possible mechanisms as end-member scenarios. This helps in roughly evaluating if they may account for the observed size, magnitudes and rates of uplift. Even such a simple approach proves some mechanisms possible or partly possible, others impossible. A more detailed evaluation of the specific mechanisms and combinations thereof is left for follow-up studies. Regarding lithospheric folding, we have strengthened our reasoning in the revised text that this mechanism cannot be considered a main cause of regional doming. The large-scale structure indicates that the area that underwent regional doming coincides with a wide syncline today (see Fig. 11). Before the uplift event this syncline must have been deeper. This decrease in fold amplitude accompanying uplift cannot be the result of maintained or increased horizontal stress. It could be due to a decrease in stress if we assume that the syncline was formed or tightened by lithospheric folding (cf. Nielsen

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et al., 2005). However, since stress relaxation cannot exhume the syncline more than it was originally deepened by horizontal stress, this assumption restricts the time available for deposition of the missing overburden to the short interval of the inversion phase (approx. 90 to 75 Ma). This is considered a highly unlikely scenario.

Interactive comment on Solid Earth Discuss., <https://doi.org/10.5194/se-2020-183>, 2020.