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Interactive comment on "Emplacement of "exotic" Zechstein slivers along the inverted Sontra Graben (northern Hessen, Germany): clues from balanced crosssections and geometrical forward modelling" *by* Jakob Bolz and Jonas Kley

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Dear Editors and Authors, thank you for the occasion to read the interesting manuscript entitled: "Emplacement of exotic Zechstein slivers along the inverted Sontra Graben (northern Hessen, Germany): clues from balanced crosssections and geometrical forward modelling" Jakob Bolz and Jonas Kley.

The manuscript provides new information about the tectonic evolution of a fragment of the southern part of the Central European Basin System. However, it seems that the authors could indicate additional facts that could contribute much more to the knowledge on the evolution of CEBS. Additional data may make this manuscript even more interesting to researchers working in the CEBS and surrounding areas.

The authors consider the Sontra structure as a tectonic graben but do not show it clearly boundaries of this structure - both normal faults: southern and northern (Figs. 1, 4 and 5). The model considers only the southern fault zone. The zone of this fault is described in detail in this manuscript. The model and geological maps indicate the possibility of considering defining the Sontra structure as a half-graben? If not, it should be clearly documented.

I suggest making a longer, simplified geological cross-section showing the position of the Sontra structure.

The manuscript should be simplified as some parts are too long and contain redundant information. An example of this is the detailed descriptions of the source data.

The authors describe two stages of deformation ("...extension most likely occurred in Late Triassic to Early Cretaceous time while the contraction is of Late Cretaceous age"), but do not provide the reasons why changes in stress fields may be related.

The authors report that other researchers (Vollbrecht et al. 2011 - lack in references) considered the role of strike-slip faulting in the formation of grabens, but did not provide strong evidence for its rejection in the formation of the Sontra structure. The authors say that they did not recognize "...strike-slip motion along the boundary faults of all three grabens". This seems to be the correct observation, because indeed in this particular place there may be no evidence of displacement. Perhaps evidence of strike-slip faulting should be found elsewhere. The authors provide details that can be considered in this way. Their figure No. 1 - a map of the area between the Rhine Massif, the Harz mountains and the Thuringian Forest indicates the possibility of a displacement along the NNW-SSE striking dextral strike-slip fault – see the fault zone marked in the western part of the map (I attached the appropriate figure to the pdf - fig 1.jpg). In the contraction zone of this fault, there are structures marked as EG and Wa. Since the authors indicate the possibility of strike-slip faulting during the contraction stage, it may be worth considering the occurrence of strike-slip faulting along the zone of the NNE-SSW direction in which the Sontra structure occurs (I attached the appropriate figure to the pdf - fig 1.jpg). The Sontra structure could be found in the contraction zone here as well as the structures in the Hils Mulde (Hi) area. Differences in the direction of the dextral strike-slip fault in the western part of the map in relation to the zone in the central part of the map may result from differences in the rheology of rocks (see the figure in the pdf file termed as refraction.jpg). Basement marked as Harz, Rhenish Massif and Thuringian Forest may cause a change in the directions of the strike-slip faults? Such a solution requires confirmation of displacement. Maybe the authors have access to more detailed maps where one can recognize for example the displacement of the hinges of folds? If there are no changes in the width of the hinge zones, then there is a 'purely' strike-slip component. Of course, another solution is to study the field outcrops along the main fault zone. If there are strike-slip faults, changes in the stress field could cause an extension and then contraction in the same place. This would explain why normal faults developed first, and consequently grabens and half-grabens (?), And then inversion occurred. The reason for the formation of theses structures would be changes in the direction of horizontal stresses from the Late Triassic to the Late Cretaceous (please see the suggestions marked on fig. 1.jpg). This could connect the Sontra structure more broadly with the Central European Basin System. Such a dextral strike-slip faulting also occurred for example further east, in the Holy Cross Mountains region. The activity of strike-slip faults that began in the Late Cretaceous (Late Maastrichtian) and lasted until the early Miocene (Langhian) (e.g. Konon et al. 2016, 2020; Skompski et al. 2019).

In addition, I suggest the authors check the area near the town of Mühlberg. The authors indicate the possibility of the coexistence of 2 synclines, the axes of which are sub-perpendicular to each other (Fig. 4 – see the intersection.jpg). The map has no contour lines, so it is difficult to verify, but maybe the intersection should be checked here to determine if the layers are not approximately horizontal? If this is not an effect of intersection, then it is necessary to explain where such fold axes come from!

The Authors presented very interesting evidence of the occurrence of inversion in this part of CEBS. In my opinion, if the indicated doubts are resolved, this manuscript will be a very valuable evidence for defining changes in CEBS, and perhaps in adjacent areas.

Warsaw, 10.09.2020 Andrzej Konon

Please also note the supplement to this comment:
https://se.copernicus.org/preprints/se-2020-133/se-2020-133-RC5-supplement.pdf

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