GENERAL AUTHOR RESPONSE

Here we have tried to identify the main points raised in the five reviews and explain in general terms how we dealt with them. Responses to all individual reviewer comments are contained in the file "Author Response to Individual Comments"

Restructure the manuscript

Following the reviewers´ suggestions we have moved all workflow-related text to the respective chapter. Similarly we have tried to move all interpretation to the Discussion section. We have retained the subchapters in the Results section because we feel that maintaining a separation between data sources and workflow enhances reader-friendliness and makes the electronic publication more navigable through hyperlinks.

We did not follow the suggestion to present the balanced cross section before the forward model for the following reason: The idea that the observed Zechstein slivers were created by inversion was conceived during field work. The forward model served to test the general geometric viability of the concept. The line-length balanced cross-sections were constructed in a second step to create more detailed structure models that closely conform to surface data. Thus, the manuscript structure follows the actual work flow.

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Choice of cross-section locations, additional sections

The two balanced section locations were chosen such that the best available data could be used. Section A (Mühlberg) was chosen to include the previously described (Schröder 1925), once easily accessible, outcrop along the train tracks near Sontra. To our knowledge this is the only location where a Zechstein sliver with its hanging wall and footwall was ever exposed. The second traverse was chosen for its proximity to the shallow well demonstrating Muschelkalk underlying a Zechstein sliver, contrasting with the Mühlberg section.

Following the reviewer´s requests we have added four additional, non-balanced cross-sections and one longitudinal section to show the effects of transverse faults vs. varying exhumation levels on the appearance of the graben.

We also included a regional cross-section to illustrate the structural setting of the Sontra Graben and to address the topic of the link between a mostly thin-skinned graben and basement faults.

Dividing the Sontra Graben into segments

Since the main subject of this study are the Zechstein slivers, it makes sense to place emphasis on their distribution along the Sontra Graben. Consequently, we introduced five segments, which subdivide the graben with regard to the existence and/or size of the slivers. This subdivision is obviously non-unique, but coincides with other structural features.

Detachment/Décollement

We changed all instances of "décollement" to "detachment", except when discussing the actual basal décollement, e.g. in line 283 (page 9), where we used the term "décollement" to discuss the problem of horse formation near the basal "décollement", meaning large-scale detachment. "Décollement: Large-scale detachment, i.e. fault or shear zone that is located along a weak layer in the crust or in a stratigraphic sequence (e.g. salt or shale). The term is used in both extensional and contractional settings." (Fossen 2010)

Zechstein strata vs. Zechstein Group

We have adjusted our stratigraphic terminology. However, we retain the term “Zechstein strata” to refer to small parts of the Zechstein Group, sometimes of uncertain stratigraphic position.

Discussing salt models from the North Sea and their interpretations

We now briefly discuss salt models from the North Sea. The general scarcity of salt-bearing horizons in our study area makes for quite different structural configurations.

Simple Shear-Algorithm

We used the Simple Shear algorithm because it was designed for extensional systems. The main aim of the forward model was to explore the necessary magnitude of normal faulting and to obtain an impression of the pre-inversion size of the half-graben, not so much the inversion phase for which Simple Shear is not the ideal choice

A more detailed description of the Zechstein slivers

We hope we have achieved this mostly by restructuring, now presenting all information in the same place. In addition, we have included field photographs for a better impression.

Strike-slip discussion

We briefly (because of existing publications on the subject) discuss the kinematics of inversion in Central Europe and have added key references.

Conclusion

We have rewritten parts of the conclusion to include a statement on the timing of the inversion phase and to make other parts more concise. In general, we feel that the conclusion section should include all main hypotheses of the article and thus inherently resembles a list of statements.

Chronostratigraphical terminology

All chronostratigraphical references now comply with the International Commission on Stratigraphy.

Figure numbering

All figures have been re-ordered and are now correctly referenced throughout the manuscript.

Figures

All major localities and those that are referenced in the manuscript have been added to the geological map. The location of the wells has been added, also. The symbology within the geological map has been updated to comply with USGS standard.

The figure displaying the outcrop along the train tracks near Sontra was enhanced with more of our own field observations and a structural interpretation.

The DEM was removed from the detail map that shows the paleogeography of the Zechstein and has been replaced with just the larger faults for orientation.

We would like to thank all Referees for their detailed comments on our manuscript and hope to have replied satisfactorily to all of them.

Kind Regards,
Jakob Bolz & Jonas Kley