

## Reply to the review by Jochem Kück

Michal Kruszewski et al.

---

Author comment on "In situ stress database of the greater Ruhr region (Germany) derived from hydrofracturing tests and borehole logs" by Michal Kruszewski et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2022-196-AC2>, 2022

---

Dear Jochem,

Thank you for your comments regarding our manuscript. Please see our replies below. The comments included in the continuous text of the manuscript, and not mentioned below, were accepted, and are already implemented into the new version of the manuscript. If you would have some additional comments to our answers or any helpful feedback, please feel free to submit more questions.

With Best Regards,

Authors

---

- Nevertheless, for a better understanding of the workflow, I tried to reproduce the process of generating a few data points in this data compilation containing my own data (Haus Aden, 940 m bottom , Kück, 1988). I must admit, however, that I could not really reproduce the values that are ultimately shown in Table 2, lines 23 to 26 of this publication.

Please be aware that the values in Table 2 (from the manuscript) are mean values from all the tests carried out at a specific location. To see all the measurements from each of the test locations please refer to the data set of all stress magnitudes (<https://fordatis.fraunhofer.de/handle/fordatis/272>).

- For one, the depth is given as 998 m but actually it was the 940 m level (Hauptquerschlag der 940 m Sohle).

From the mining reports the NHN (or then the NN) level is 938 m, whereas the actual depth below the surface was 998 m. We select the latter to compute stress gradients etc. and for further analysis of stress data. To avoid misunderstanding and clarify the difference in numbers we will explicitly mention this in the manuscript text.

- Could it be the stress relocation effect of the cavity of the gallery was not considered,

because it seems always the highest stress values were chosen no matter at which distance to the gallery wall these were measured?

Yes, this is correct. We have not assessed the individual data records (measurements) if they are potentially influenced by excavations or other man-made effects. This should be, however, the task for further studies. The key goal of this study was to make all available data public without any interpretation in the first place. We will add this information more prominent in the manuscript and state more clearly that individual data records may be influenced by mining activities and, thus, may not represent the undisturbed in situ stress state.

- In line 23 (vertical borehole B2V) I can recognize the average  $S_{hmin}$  of 14.2 MPa and the  $S_{Hmax}$  of 25.4 MPa, where always the maximum occurring value given in the Diplomarbeit is 23-26 MPa was used.

We assume that you refer to Table 2 from our manuscript and as stated before the values given there are mean values from a given test location. For the specific location that you refer to we have six stress measurements, where the values of  $S_{hmin}$  from these tests were 9, 11.5, 17, 18, 15.5, and 14 MPa (with an average  $S_{hmin}$  of 14.2 MPa and a SD of 3.4 MPa), whereas the computed values of  $S_{Hmax}$  are 17, 18.5, 29.3, 30.5, 30, 27 MPa (with an average  $S_{Hmax}$  of 25.4 MPa and SD of 6.0 MPa). However, we have decided to recompute the  $S_{Hmax}$  values based on the  $S_{hmin}$ , mean  $P_r$ , and assumption of no pore pressure rather than taking values from the report. As a result, values from the hydrofracturing report presented in Table 1 (see attachment) and values in our manuscript differ slightly. In the end, we find the recomputed  $S_{Hmax}$  values from the hydrofracturing report (Table 1; see attachment) as questionable as the  $S_{Hmax}$  magnitude in some cases seems to be lower than the  $S_{hmin}$  magnitude. However, if you have more insights here, we would be very happy to discuss this issue in more in-depth. We will extend the text accordingly to make the reader aware why there are differences in numbers.

- In line 25 (vertical borehole B4V) the  $S_{Hmax} = 21.3$  MPa, but in the Diplomarbeit the highest  $S_{Hmax}$  value is 14 MPa only. Long story short: I assume that the values given in the publication were correctly determined by a procedure that I simply cannot resolve.

In the well B4V, the same principle as before (i.e., in the well B2V) was applied. The values of  $S_{Hmax}$  were recomputed from the three stress measurements, within this test location, based on the  $S_{hmin}$  magnitude, mean  $P_r$ , and assumption of no pore pressure rather than taking values from the report (see Table 2 in the attachment) and resulted in 22, 22, and 19.8 MPa (with an average of 21.3 MPa and SD of 1.3 MPa). Again, some of the predicted values of  $S_{Hmax}$  in the report seem to be below  $S_{hmin}$ , which we consider as questionable. However, if you have more insights here, we would be very happy to discuss this issue in more in-depth.

Here also some discrepancy between results presented in Kück (1988), where results from 4 hydrofracturing tests were presented and the report from MeSy GmbH from 1994, where only 3 tests were presented, was observed.

Reply to comments from the manuscript:

- Iserlohn is not visible on the map

The figure we are referencing is Figure 1c, Iserlohn is on this figure (see on the right side of the figure).

- Shouldn't the plot 'd' be left of 'b' chronologically and in the same sense as in plot 'a'?

We created this figure, so it goes chronologically with what is mentioned in the text of the manuscript. Thus, we think that this is appropriate and would like to leave the figure as it is.

- Some discontinuities appear in black but in the caption the darkest color seems to be violet, maybe choose another color like red.

We would like to abstain from using colors like red and green which could mean 'bad' and 'good', as the uncertainty of the input parameters for computation of slip and dilation is high and we would not like to 'scare' the audience. The values presented in our paper should be treated more in a relative sense and proper probabilistic assessment of fault reactivation potential, including wide uncertainty of all input parameters, in the area should be carried out in the future using our data set. Also, the color scheme we selected is more readable for people with disabilities. Thus, we would like to leave the figure as it is.

Please also note the supplement to this comment:

<https://essd.copernicus.org/preprints/essd-2022-196/essd-2022-196-AC2-supplement.pdf>