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Discussions

Interactive comment on "Characterization of fractures in potential reservoir rocks for geothermal applications in the Rhine-Ruhr metropolitan area (Germany)" *by* Martin Balcewicz et al.

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Dear Editor

The paper is about evaluation of potential geothermal reservoirs using field and lab data. The topic is high demanding and interesting for a broad range of communities. Data were surveyed and measured accurately, which worth to be published. The conclusions are qualitative, which goes back to the nature of data. I think more data from extensive field survey, surface sampling and core drilling to digital imaging, numerical

computation and simulation of, for example, DFN are needed to finalize this subject and to present a conceptual model. However, I support the paper for publication in this step, since it can be the basis for future advancements in this topic. The paper is well organized with perfect literature survey and proper English. However, it suffers from lack of visualization. Although the authors explained everything in detail in the main body, a reader tends to touch the results visually by figures and plots. So my main comment is about a more informative geological map showing the results of the study. I have also some minor comments which are as follow:

- Geological map lacks of enough data. I mean, all information in the text must be transferred into the geological map. Then, in a regional point of view, all data could be connected, judged and concluded. The most important points are:

i. Putting rose diagrams of all sites on the geological map

ii. Showing strike and dip of the target layers on each site and if possible on the other areas.

ii. Showing orientation of the dominant and/or present day maximum stress (either from literature or the authors observation).

I tried it as the attache figure. Based on maps in my figure, Hönnetal site is located on an anticline axis. The authors should be careful about combining fractures orientation data from this site with other sites. They should explain:

a. How are those rose diagrams are connected to each other?

b. How are they connected to the regional tectonic regime?

c. Line 417: "The foundation of our model is an approx. 300m thick carbonate layer, dipping northwards at a shallow dip angle of about 30 to 40 °". Fracture orientations on the anticline axis (HLO) show a different pattern compared to downward limbs (WHO, HKW). How do the authors combine them together?

- Section 4.2.1: The authors explain "The main discontinuity orientations were documented as NNW-SSE, NW-SE, and NE-SW." and then conclude "we propose to focus on discontinuities that are approximately oriented N-S for future shallow geothermal applications.". Is N-S one of the main directions or what? Is this conclusion on the basis of maximum stress direction? How is the contribution of the other factors such as fracture filling, conductivity and so on?

- Use different parameter for thermal connectivity and discontinuity frequency (both of them are λ)

- Figure 6: How do you translate connected pores more than total pores?
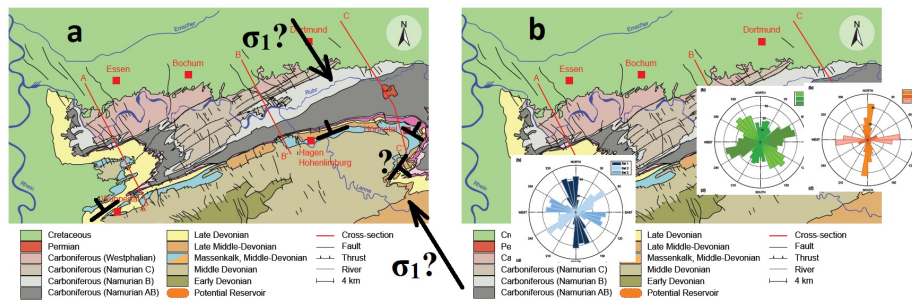
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Fig. 1. An example of preferred geological map with data and results of this study

C4