

Interactive comment on “Pedological and hydrogeological setting and subsurface flow structure of the carbonate-rock CZE Hainich in western Thuringia, Germany” by Bernd Kohlhepp et al.

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Summary: I read this study with great interest as it is one of the rare efforts to characterize the entire critical zone in a holistic manner with respect to its hydraulic, (hydro-) geological and hydro-chemical characteristics. To this end the authors draw from a comprehensive and diverse data set that has been collected in a rather complex and karstified hydrogeological setting in Thuringia. Specifically they combine a survey of soils and land use, various geophysical techniques and drillings to infer on subsurface strata with data from a large amount of ground water wells and comprehensive hy-

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dro chemical data collected during several sampling campaigns. The authors synthesize the different data sources into a conceptual model of their study area through a combination of process based reasoning, expert knowledge and multivariate statistical methods.

Evaluation: The study is based on a very sound data set, the manuscript reads well and the joint discussion of the different data and their synthesis to conceptual model is appealing. But as it stands it remains a very sound and thorough study of a single case, because the authors miss quite obvious opportunities to address more generic questions. Furthermore, the characterization appears not so holistic. With respect to the treatment of the soil, the assessment steps barely beyond a soil standard survey. I thus encourage the authors to extend their analysis by addressing more generic questions using the beautiful data they have at hand. I hope the authors will find the following points helpful to further optimize their study for the reader and to fully explore the potential of their effort.

Major points:

- An obvious question that could be addressed is how much of the proposed experimental and monitoring effort is needed to come up with such a comprehensive assessment – or the other way around how much of the information can be left out before without changing the quality of the conceptual model. This question could be easily addressed by taking the presented insights as the best guess of the unknown truth and stepwise leaving out increasing amounts of for instance their hydro chemical data (in space and or in time) and perform the same multivariate analysis.

- The characterization of the soil is compared to the characterization of the deeper sub-surface rather descriptive and follows mainly standard mapping approaches. I wonder whether any data on permeability and infiltrability were collected? Even if, not the analysis of the available soil types lacks behind its potential to infer on recharge areas. The latter depend on the ks, retention properties and apparent preferential pathways

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and the spatial pattern thereof. Even if the latter were not mapped, one could use a pedo transfer function to estimate k_s and compile a geostatistical analysis with interpolation or even conditional simulation. This would yield an estimate on potential hot spots for recharge.

Technical details:

- Generally the figure caption are very brief. Figure 4: how much variance is explained by the first two principle components? I didn't find it in the text, would be nice to provide it here.
- I guess the color code in Figure 5 represent the cluster in Figure 4. Would be helpful to add that to the caption, also of Figure 6.
- Figure 7. Is the error bar the standard deviation of the sample or the root of the estimation variance of the average. I guess the latter is more appropriate to infer on significant differences.
- The reference in the section 4.1 (infiltration properties) is not the most recent one, particularly not with respect to preferential flow. Furthermore, this part is rather descriptive and could possibly be written without the data you have.

Best regards,

Erwin Zehe

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