



EGUsphere, referee comment RC2
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Comment on egusphere-2022-703

Anonymous Referee #2

Referee comment on "Geoelectrical and hydro-chemical monitoring of karst formation at the laboratory scale" by Flore Rembert et al., EGU sphere,
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This study presents an experimental study of the calcite dissolution-induced permeability change in carbonate rocks. The electrical conductivity is used to monitor the experiment, and the measured electrical conductivity is used to infer material pore structure changes. Insights into the link between k and electrical conductivity (and related parameters) are made. In general, this manuscript is well-written and easy to follow. The reported experimental data are new and provide valuable datasets other researchers can use for similar purposes. The data analysis is based on using theoretical models, and thus it gives many insights that otherwise can not be obtained from traditional data analysis. Therefore, I am in favor of publication.

Specific comments:

I have several minor comments and hope the authors can consider in revising their manuscript.

(1) Different flow conditions

Page 6 (line 102): the authors mentioned E04 and E05 have different flow conditions. Also, the Peclet number is introduced here to characterize the flow condition. It would be helpful if the authors could talk a bit more about the dissolution pattern related to these two flow conditions. Are we expected to see different flow patterns for these two samples? Based on the experimental results, it seems that the dissolution patterns of the two samples are quite similar.

(2) Section 3.2

The authors provide some analysis of the chord length distribution of the two samples before and after the experiment. The current version of the manuscript does not explain very well what a "chord length" is and how "chord length" is related to "pore size" and "pore throat" size. Moreover, the main parameter m_j estimated from chord length distribution is also not well explained in terms of its physical meaning. Also, the authors mentioned (Line 230) "the evolution of m_j is not a sufficient indicator of the effect of dissolution on the sample". If this is the case, what is the purpose of keeping Section 3.2 then?

(3) I feel that there are too many metrics/parameters discussed in this study. (Yes, one valuable benefit of the experiment in this study is that it can provide different types of data for analysis). A discussion of all of the acquired parameters/properties makes it somehow difficult for readers to understand the key findings of this study. In my opinion,

the most interesting and unique finding of this study is that the constrictivity changes significantly during dissolution; in contrast, the hydraulic tortuosity does not change. Other discussions such as $k\text{-}\bar{r}$, $k\text{-}F$, and $\Lambda\text{-}k$ relations, are less important than hydraulic tortuosity and constrictivity. My suggestion is to put more emphasis on the discussion on hydraulic tortuosity and constrictivity.