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Solid Earth Discussions

Interactive comment on "Petrographic and Petrophysical Characteristics of Lower Cretaceous Sandstones from northern Israel, determined by micro-CT imaging and analytical techniques" *by* Peleg Haruzi et al.

Anonymous Referee #1

Received and published: 4 March 2019

The authors present a regional study on petrographic and petrophysical properties of a layered sandstone from Israel. The paper is not meant to improve process understanding but aims at characterizing the rock with a broad mix of methods (laboratory, imaging, simulation). Therefore, the value of this paper is supposedly to provide a reference for future studies working in this rock formation.

The paper is a bit lengthy, but easy to follow for its good language and clear structure. Some more data could potentially be outsourced into the appendix. I can only comment on the imaging and flow simulation parts of the paper, as I have very limited expertise

in geology. Hopefully, this is covered by other reviewers. The following comments address only minor details:

-line 200-2013: It is unclear to me how many simplifying assumptions are in the Katz & Thompson approach to derive lc, lmax and eventually k from MIP data. For instance, is the ratio 1/89 defined for a capillary bundle model with a specific shape of the cross section, or some percolation-type network model? Some more information should be provide here or later in the discussion section.

-line 229-240: What software was used for the non-local means filter, converging active contours, etc.? How were the parameters for each processing step determined? Manual by expert knowledge and then kept constant for all three samples? Software information is also missing for variogram analysis (line 262).

- line 303-305: Please explicitly state which software was used to determine tortuosity. Somewhere later in the text it was mentioned that Comsol was used (line 594).

- Line 308-313: How where the number of grains determined? By watersheding on the distance map of the binarized grain images?

- Line 350: Unclear, which method was used to capture Fig 3(i)

- line 667: Meaning of the sentence unclear to me: "A possible . . ."

- line 732: I'm well aware of the partial volume effect, but it is unclear how you can quantify surface roughness from the volume fraction of unresolved porosity. Please explain.

-line 744-759: Since the number of grains N is always positive, the connectivity index should always have the same sign as the Euler characteristic. I wonder why all CI values are positive in Table 2 are positive. A well connected pore network such as sample 3 should evoke a very negative Euler characteristic. Please explain in the text.

Line 911-912 and Line 930-931: So is it 84% or 50%? I guess one corresponds to S1

and the other to S3, but this needs to be made clear in the text.

- How many replicates plugs per layer and method? Information appears sporadically at several occasions in the manuscript (e.g. line 391, 423, 476 Figure 10). Could you add this information at an appropriate location in one of the tables?

What's the information gain between Fig. 7(a) and Fig. 8? Maybe merge both figures into one.

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