Dear editor, dear reviewers,

We thank the reviewers for the careful inspection of our manuscript and providing useful comments and recommendations that helped to improve our paper. We made effort to address all the reviewer's comments. Beside numerous corrections and further text, we added new Figures (Fig. 1E, F), a new table (Table 3), and another nine references. You find our answers in blue color. We highlighted the changes in the text by yellow background.

D. Healy (Referee)

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General comments

This ms is a comparison of 4 methods for characterising pore space, especially pore size distributions. Data from tests on 2 sandstones are compared. Overall, it is a good idea, quite well presented, and should provide a useful addition to the literature. It's easy to suggest extra tests or analyses but the 4-way comparison stands as is (but see below), and the separation into methods better suited for pore bodies and pore throats is good. I think this paper could be acceptable, subject to moderate revision. My main issues are with the relative lack of quantitative comparison of the methods, and the apparent underlying assumption of power law behaviour. E.g. in Figures 3 and 7, assuming you can make a case for power law behaviour, what is the departure of each line/method from a modelled power law prediction? The paper does not go anywhere near far enough in this regard, in my opinion.

We thank for the positive evaluation of the general idea of our manuscript with the focus on a comparison of different methods regarding their potential for a detailed consideration of pore size distributions over a wide range of radii.

Specific comments

Line 88-90 – much more clarity needed here; a log-log plot of these variables MAY show a straight line, which COULD then be interpreted as power law behaviour. Are you assuming a power law, and therefore fractal behaviour of the data? Perhaps a Maximum Likelihood Estimator approach might be relevant here (Clauset et al., 2009 SIAM Review; Rizzo et al., 2017 Journal of Structural Geology).

The reviewer is correct. The presentation of the cumulative pore volume as a function of pore radius as log-log-plot, which corresponds a power law behavior, is necessary to recognize the

fractal behavior of the pore volume. A deviation from an idealized straight line indicates non-fractal behavior. We add the content of Maximum Likelihood Estimator considering the underlying assumption for power law behavior.

Line 106-107 – but this limit is rock/ CT scanner/segmentation dependent, right? So add the caveat, 'for this study, the CT resolution limit is . . .'.

Correction done.

Line 165 – 'arguable'

Correction done.

Line 199 –'extent'

Correction done.

Line 231, 243 – 'mainly'; can you be more specific about the modal proportions of minerals?
Correction done.

Line 240, 256 – what method for the porosity estimate?

Correction done.

Line 249 –'depositional'

Correction done.

Line 251 – 'shows'

Correction done.

Line 384 – 'extent'; 'differs'

Correction done.

Line 401 – 'of' not 'on'

Correction done.

Line 508 – Table 2; these are not mineral phases, they are chemical components!

Correction done.

Line 512/Fig 1 – SEM; what detector, BSE? Say so.

The detector is BSE detector.

Line 520/Fig 2 – I think we need to see ‘raw’ data for these methods; AND then the ‘processed’ data using the ‘known’ porosity. Let the reader judge the data.

Line 538/Fig 6 – as for Fig 2; let’s see the raw data.

Figure 2 and Figure 6 are the ‘raw’ data, and Figure 3 and Figure 7 are the ‘processed’ data using the ‘known’ porosity.

Line 523/Fig 3 – my point above about assuming power law/fractal behaviour (NB, not the same thing) is borne out by these non-linear data. . .

Line 544/Fig 7 – these look quite non-linear; comment?

The whole curves in Figure 3 and 7 are non-linear, that is correct, so we only use an interval with a constant slope. We add the text in the Discussion: “The whole curves of the four methods are non-linear, and a Maximum Likelihood Estimator (MLE) approach might be relevant here (Rizzo et al., 2017). For example, in the case of the NMR curve of Bentheimer sandstone, the fitting of all data using the MLE reveals that the log-normal distribution is the most likely distribution with the estimated parameters μ=3.43 µm and σ=0.82 µm. These two scaling parameters are the logarithmic mean and logarithmic standard deviation, respectively”.

Figure 7 seems an odd choice of final figure; perhaps add a sketch/cartoon of pore space, pore bodies + pore throats, and their distributions; mapped to the ‘best’ tools for quantifying them.