

Interactive comment on “Enhanced pore space analysis by use of μ -CT, MIP, NMR, and SIP” by Zeyu Zhang et al.

D. Healy (Referee)

d.healy@abdn.ac.uk

Received and published: 20 June 2018

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

C1

does not go anywhere near far enough in this regard, in my opinion.

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). 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 ...’. Line 165 – ‘arguable’ Line 199 – ‘extent’ Line 231, 243 – ‘mainly’; can you be more specific about the modal proportions of minerals? Line 240, 256 – what method for the porosity estimate? Line 249 – ‘depositional’ Line 251 – ‘shows’ Line 384 – ‘extent’; ‘differs’ Line 401 – ‘of’ not ‘on’ Line 508 – Table 2; these are not mineral phases, they are chemical components! Line 512/Fig 1 – SEM; what detector, BSE? Say so. 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 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 538/Fig 6 – as for Fig 2; let’s see the raw data. Line 544/Fig 7 – these look quite non-linear; comment? 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.

Dave Healy Aberdeen June 2018

Interactive comment on Solid Earth Discuss., <https://doi.org/10.5194/se-2018-42>, 2018.