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Interactive comment on "Fracture attribute scaling and connectivity in the Devonian Orcadian Basin with implications for geologically equivalent sub-surface fractured reservoirs" *by* Anna M. Dichiarante et al.

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We thank Dr Andrews for his supportive comment. We are pleased that he found our study of clear importance and of relevance to readers of Solid Earth. We address in this reply his major comments and we have taken his minor comments on board in our extensive revisions to the manuscript. We have reorganised the manuscript and introduced new material to support our assumptions and discussed the limitations much more explicitly.

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1) The analysis of several sets and fracture types within the same population.

This point has also been raised by both reviewers. We have explicitly addressed this issue in our revised paper in the following ways 1) We make it clear that the attribute analysis is focused on the Group 3 structures identified by Dichiarante et al (2016). These include both faults and opening mode strcutures where we observe them in outcrop. At our Dounreay location, faults with metre-scale contained the same mineralisation as opening mode fractures. They clearly contributed to the flow in the subsurface. In fact they are also conduits for meteoric/groundwater fluid flow in many cases as these faults are wet and the surrounding rocks are dry. 2) In the discussion we make it clear that the assumption that the extent to which the scaling of fracture aperture attribute from macro-scale to the regional scale structures needs to be tested.

2) Subjective bias during the digitisation of fracture traces We thank the reviewer for highlighting this aspect of the study and drawing our attention to his interesting paper. We accept the point that variations in the exposure and the presence of the ruler in the photo will have created a bias in the results. We have added some discussion of this aspect to section 6 in our paper.

3) Power-law versus Log normal The reviewer raises a very good point. We agree that the power law slope and intercept values could reflect variations in lithology, proximity to major structures and other aspects that would be relevant to producing a geo-model. We don't have enough data in this study to say much about this but would draw attention to a recently published Open Access paper (McCaffrey et al 2020, J. Geological Society of London) in which we reported over 100 fracture datasets in basement lithologies. In this much larger study, we show that proximity to major structures produces an increase by more than an order of magnitude in fracture intensity (y-axis intercept) for aperture data. Differences in the scaling (power law exponent) we attribute to different preservation levels below regional unconformities. There is clearly more work that can be done on this aspect.

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