

Solid Earth Discuss., author comment AC2  
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## Reply on CC1

Emma A. H. Michie et al.

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Author comment on "Fault interpretation uncertainties using seismic data, and the effects on fault seal analysis: a case study from the Horda Platform, with implications for CO<sub>2</sub> storage" by Emma A. H. Michie et al., Solid Earth Discuss.,  
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Dear Billy,

Thanks for your detailed comments, and thank you for the suggested papers.

- I appreciate the caution you mentioned when essentially 'ignoring' any finer scale features, as I'm sure there are many geologists out there who would also be very cautious of this. However, utilizing every line spacing for means of creating a fault surface, unfortunately, showed a heavily increased irregularity to the surface. While faults are indeed very irregular in nature, the irregularity shown here appears to not be a product of the fault surface, but more of human error and triangulation method used. Although rigorous QCing was performed to maintain continuity between each line, the nature of seismic resolution means that picking the precise location of the fault is almost impossible. Hence, any very subtle variations where the fault has not been precisely picked will carry through to the triangulation method, and can create a surface that is very irregular with many kinks that aren't actually there in nature. Of course, with higher resolution seismic (e.g. P-cable), the uncertainty of the location of the slip surface is reduced. However, no seismic will allow us to 'see' the fault as we do in the field, and hence some uncertainty will remain.

Note that the suggested 100 m spacing is for fault surface creation, e.g. for fault stability analysis. I would suggest using all data available for fault polygon (horizon-fault cutoffs) picking for fault seal analysis. The suggested 100 m spacing is based on the final fault surface that most accurately honours the geometry of the picked fault segments, and also corresponds nicely with the line spacing that captures all fault segmentation that has also been observed when every line (25 m spacing) is used (based on T-D plots).

- Thanks for your comment on bias – I shall make sure Clare Bond and others are referenced and discussed more thoroughly. The background of the two interpreters are similar, both are structural geologists at similar stages of their career, although the level of professional training does vary (both software and practical – e.g. fieldwork training etc). I agree that mental models are formed through these types of training and are brought through to seismic interpretation – something that is likely to have happened here (although to a slightly lesser degree than that described in Clare Bond's work).

Thanks again for your comments – I will try to incorporate the suggested changes to the manuscript.

All the best,

Emma