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Solid Earth Discussions

Interactive comment on "The Impact of Seismic Interpretation Methods on the Analysis of Faults: A Case Study from the Snøhvit Field, Barents Sea" *by* Jennifer Cunningham et al.

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This manuscript presents the results of a seismic interpretation experiment where the line density of interpretation is systematically varied. The results are tested by measuring various structural geological attributes. As the authors imply, the conclusion is intuitively obvious (denser interpretation = better), but surprisingly no work has previously been published to this effect (though the idea has been employed in training courses by me, my colleagues, and others across the petroleum industry). Therefore it is well worth publishing, with only minor revision.

There are a number of very relevant references that are not quoted, and which ap-

proach the same problem from a slightly different angle. Several deal explicitly with the relay ramp geometry, or more generally with the issue of fault linkage in sparse data. For the benefit of the authors they are:

* Solum et al 2016. "Increasing interpreter capability in structurally complex settings....". In: 3D Structural Interpretation: Earth, Mind & Machine, AAPG Mem. 111.

* Yielding & Freeman 2016. "3-D seismic-structural workflows....". Also in AAPG Mem. 111.

* Richards et al 2015. "Interpretational variability of structural traps....". In: Industrial Structural Geology, Geol.Soc. SP 421.

* Wood et al 2015. "The missing complexity in seismically imaged normal faults....". Also in SP 421.

* Needham et al 1996. "Analysis of fault geometry and displacement patterns." In: Modern developments in structural interpretation...". Geol.Soc. SP 99.

Minor comments for the authors:

* The abbreviations IL and XL are used in two senses - inline and crossline, as initially defined at line 38, but also "inline spacing" and "crossline spacing", for example in Fig.2. The text in Figure 2 might be read as meaning 32 inlines were picked in Expt.1, 16 inlines in Expt.2, etc. Keep IL and XL for just inline and crossline, and add "spacing"wherever it is needed.

* line 180: Explain that "2D auto-tracking" means tracking along a horizon on a vertical section. Additionally explain the exact technique used - I assume you picked endpoints of each horizon segment in each fault block, rather than picking the two ends of the section for the auto-tracker to work along the entire faulted profile. The issue of what an autotracker does at fault breaks is very significant in terms of the time needed for remedial editing, particularly moving to the 3D case. In my experience there will always be cases where the tracker can erroneously go across the fault onto a different

reflection - see discussions in Yielding & Freeman (2016) and Needham et al (1996), listed above. The best way to stop this is to pick the fault planes first, then use them as lateral boundaries for the autotracking.

* line 230 et seq: I recommend you include an example of a tensor slice (in or after Fig.3) to illustrate this form of data. I assume it looks like a coherence slice?

* line 284: reference here to Top Kolje - you should add this horizon to Figure 1d. so that the reader can see where it is on the seismic.

* Figure 4b - you might want to borrow a map+3D version of this from figure 10 of Yielding & Freeman 2016.

* line 496 - mention that this issue is a software limitation, not something inherent in the structural geology.

* Section 5.2.2: you have concentrated on the volumetric implications in your discussion. I think you should maybe add a few sentences to describe the implications there might be for reservoir development. Subtleties in fault linkages, as revealed by better interpretation, might have a big effect on fluid flow during production (e.g. Fig.13 of Jolley et al 2007, Petroleum Geoscience, 321-340).

Some typos....

* As mentioned by David Tanner, there are lots of missing commas, which impedes the fluency of reading. Ensure that subordinate phrases and clauses having a closing comma.

* line 106 - should be e.g. not i.e.

* line 148 - the old software name was TrapTester with both T's upper-case.

* line 162 - orientation not orientations.

* line 248 - horizon not horizons.

* line 501 - occurs not occur.

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