

## ***Interactive comment on “Eliciting geologists’ tacit model of the uncertainty of mapped geological boundaries” by R. M. Lark et al.***

**C. Bond (Referee)**

clare.bond@abdn.ac.uk

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The paper provides an interesting addition to the growing body of literature on uncertainty in Earth Science and in the application of expert elicitation in this context. In general I feel that the literature included is rather sparse and given the relatively limited number of publications in this area of study in Earth Science more literature could have been included to acknowledge work by others, especially those that have applied expert elicitation techniques to geological interpretation. (e.g. Polson and Curtis, 2010). To make the results accessible to your ‘average’ Earth Scientist/Geological mapper then the statistical elements (equations etc.) need to be fully explained. Just providing the statistical notation does not do this.

The paper is somewhat theoretical in its application of the techniques and scenarios  
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supplied to the participating geologists. The generic/abstractness of the scenarios may be useful, but as geological scenarios (and hence boundaries) are by their very nature unique and the decisions geologist make are based on these unique features application of the results are not necessarily transferable to other scenarios. This was picked up by the participants and is mentioned in the discussion. But the authors still imply the technique may be generically applicable – this needs much more robust testing.

My concern is that geologists mapping in the field make decisions based on observations in 3D space that they represent on a 2D surface, a map (DEMs can also be used and interpreted onto in the field - although we are still some way from this being easy and effective). In doing so geologists are never interpreting a point on a geological boundary - they are thinking about it as a surface which intersects topography and is represented as a line on a map. Hence the tests set (The scenarios) do not really mirror a geological workflow. To me this is critical and questions the applicability of the results. This needs to be brought out more in the discussion in my opinion.

I make some specific comments on the text below:

Pg 150 first paragraph There are many places globally where geological boundaries can be observed directly (i.e. where there is no vegetation cover).

Pg 151 lines 7-8 I don’t understand this e.g. example. Boreholes don’t show outcrop – a scenario of two outcrops would seem simpler?

Pg 153 lines 25-23 I think the authors should acknowledge here that this is not the first application of expert elicitation methodology to Earth Science e.g. Polson and Curtis (2010) and other examples..

Pg 154 line 15 Yes lines are distinguished like this in the field, but not on a fair copy map see Bond (in press) <http://www.sciencedirect.com/science/article/pii/S0191814115000607> for an example.

Pg 154 line 17 Could add in Polson and Curtis reference here to.

Pg 158 line 13 It would be useful to indicate here and in other instances in the paper where those identified are authors of the paper.

Pg 160 lines 11-15 Do you discuss the issue of potential bias resulting from knowing whose results were whose and the influence of personality, seniority etc.

Pg 161 Explain the equations and text so that a geological mapper – who is not a statistician, knows what has been done.

Pg 163 lines 23-27 The hypothetical and abstract nature of the scenarios is highlighted here by group discussion, with an individual arguing that isolated patches of terrace material would mislead interpreters. These patches are not presented in the scenario and are imaginary. In a real case these would either exist or not.

Pg 167 It would be useful for the authors to acknowledge the uniqueness of individual geological sites, and recognise that most decisions will be site specific.

Pg 168 line 1 It would be useful to reference herding here and again reference Polson and Curtis who have previously shown this effect in an elicitation based on features in seismic image data.

Pg 169 lines 11-13 I am not clear on what you mean by the tendency to conflate the transect – can you explain better what is meant?

Pg 169 line 20 Explain what you mean by 2D map polygons – what is the context for these – what do they represent?

Pg 169 lines 20-25 My concern is that geologists mapping in the field make decisions based on observations in 3D space that they represent on a 2D surface, a map (DEMs can also be used and interpreted onto in the field - although we are still some way from this being easy and effective). In doing so geologists are never interpreting a point on a geological boundary - they are thinking about it as a surface which intersects

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topography and is represented as a line on a map. Hence the tests set (The scenarios) do not really mirror a geological workflow. To me this is critical and questions the applicability of the results. I really think this should be discussed more broadly here.

Pg 170 line 20 What do the authors mean by anchoring in this context? Using all available information for a decision on boundary placement at a site I would not term as anchoring.

Pg 171 line 20 Useful to explain the BGS codes in the description.

Figure 2 – expert C needs to be highlighted.

Figure 3 – explain the scaled beta values etc. in the caption

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Interactive comment on Solid Earth Discuss., 7, 147, 2015.

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