Solid Earth Discuss., 7, C530–C533, 2015
www.solid-earth-discuss.net/7/C530/2015/

Solid Earth
Discussions
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Interactive comment on "Eliciting geologists' tacit model of the uncertainty of mapped geological boundaries" *by* R. M. Lark et al.

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Received and published: 29 April 2015

Please note that in all responses we use the page numbers from the "printer friendly" version of SED and line numbers (reset on each page). Not all reviewers did this.

Reviewer 1

Style. We will aim to shorten sentences, but are not aware of any unnecessary repetition, and no examples are given. If the editor has any guidance on this comment we would be grateful.

Types of uncertainty. Conceptual uncertainty is concerned with whether a boundary is

a physical 'object', a clear contact between two contrasting materials, or marks some interpretation of essentially continuous variation, such as a gradational boundary between two superficial deposits. This is distinct from interpretation uncertainty, which, as stated at page 151 line 12 et seq. arises because a contact between units cannot be seen everywhere so the continuous boundary drawn on the map is an interpretation of available evidence, constrained by limited observations of the contact (e.g. at quarries or cuttings) and correlated topographic features. In fact conceptual uncertainty is very much what the reviewer means by *uncertainty of classes* within *the boundaries*. We recognize that the introduction of conceptual uncertainty at page 149 line 14 relies almost entirely on examples, and will strengthen it with a sentence like the opening one of this paragraph.

Strength of participating characters. We agree that the facilitator's role is important, and comment on this (page 169 line 5). This is made explicit in the literature on 'behavioural aggregation' methods for elicitation, such as SHELF (see O'Hagan et al., 2006; and our response to reviewer 4 comment 4 below). It was important that the geological facilitator was an experienced senior geologist who could make a ruling on an interepretation of the scenario descriptions, and modify these authoritatively. We can add here observations on the importance of the facilitator being able to deal with what the elicitation literature calls 'incorrigible individuals'. However, as we note in the discussion (page 168, line1–13) while, in certain scenarios an individual might convince the group to adopt a distribution with features that only he had put in his individual elicitation, in all cases the group consensus differed somewhat from any one individual distribution without ever being a simple pool of all of them. Furthermore, in one case, different experts maintained contrasting views on the appropriate distribution for the uncertainty of a boundary even after substantial discussion.

Interpreting line work. As we discuss in more detail below in response to reviewer 4, the elicitation is indeed concerned with how we interpret a line already on the map

rather than saying, 'how should we draw a line here?' What we are saying to the panel (see page 154 line 18 et seq.) is, 'given this boundary, which has been drawn by a BGS surveyor, what does your mental model of the uncertainty of mapped boundaries (developed as a BGS surveyor) tell you about the likely uncertainty in the true position of the boundary the surveyor sought to map on a notional transect.' We will clarify this in revision of the paper, see third paragraph of our response to Reviewer 3.

Translation to vegetation and soil mapping. We would gladly offer a comment on this in the revised paper. In fact, the loss through retirement of staff with experience of field mapping experience, which is part of the motivation for this study, is probably even more acute in soil survey.

Specific comments.

- Line 68 (page 149 line 22) agreed
- Line 417 (page 158, line 19–22) We will clarify that the SHELF procedure requires a practice elicitation on a random variable for which the facilitator knows the distribution, in this case the age of a randomly-selected delegate to the EGU congress.
- Line 165 (page 162, line 23). Not all BGS products based on linework are maps, for example, a hazard class for a particular insurance product may be provided for postcodes, and is derived from underlying linework.
- Line 662, 664 (page 165, lines 13, 15). Brash means 'broken loose rock in soil' (OED), we will insert this in the revised paper.
- Line 680 (page 165, line 260). We will clarify the usage of 'indurated' in this context along the following lines: '...due to induration (the process by which the

country rock is hardened as a consequence of mineralisation in the vicinity of the fault).'

- Line 865 (page 170, line 20). Anchoring. We will clarify the very specific meaning of this term in the psychological discussion of uncertainty and elicitation.
- We think that the lithology codes, which are part of the original scenario description, should be included for completeness. However, providing a full key to them would take up a fair amount of space. We have provided a reference in which they are explained.
- Scenario 3. Note that this is not a distribution of mapping error (with all sources of uncertainty) but of the interpretation error. It is tightly constrained here because there is a fair amount of information, including an exposure in a quarry, near to the location of interest.
- Figure 3. This was provided to the panel, and gives the precise context to the scenarios in terms of the disposition of the two units, and slope and dip direction in one case. We therefore think it should be provided to the reader
- The lines for B and C coincide, we shall add a comment to this effect in the caption.

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