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Interactive comment on “Expert modelling of a geological cross-section from boreholes: sources of uncertainty and their quantification” by R. M. Lark et al.

Anonymous Referee #2

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The paper addresses an important issue, the quantification of the uncertainty of geological models, that are created by geological experts. By setting up a carefully designed experiment, the authors were able to conduct an in-depth analysis of the sources of variation / uncertainties in the results of the various modelers. The results indicate that there was no systematic bias between the 28 participants, and that the variance appeared to be stationary: not depending on the actual location of the interpreted points. Expertise (self-judged) played also a role in the explanation of the variation between the modelers, which is entirely plausible, although not always taken into consideration in the day-to-day practice of modelling. The analysis resulted in a statistical model, from which confidence intervals were calculated, which is a significant

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result for e.g. design purposes, like in the case of constructing a tunnel.

My main concern about this paper is in the presentation of the data and the methods. This paper is presented in a geological-oriented journal and I would expect that the geological context would at least be properly described. Unfortunately, there is very little information about the general context of the modelled units, the variation that can be seen in the cross-section, or even a simple map and cross-section, showing the location of the cross-section (not everybody is familiar with the topography around London). I would have a better appreciation of the results if I would know the geological background of the units, the variation that is encountered and the distance between boreholes. In Figure 1 and 2, the cross-section error seems quite large to me, and in Fig.3 and 4 the 95% confidence interval is also large (± 5 m). Is there an explanation for these large errors, is the geology very erratic / variable or is there another explanation?

The Data Analysis part of the paper can be made more concise. The extensive description of the different models and its variants could probably be moved to an appendix, with a more condensed version of it in the main text. In my opinion, the extensive data analysis part distracts the general reader from the results by putting too much emphasis on methodological details. An overview table showing the different variants would be highly beneficial. Also a table with the explanation of the different symbols used and their meaning would be appreciated.

The presentation of the results is given in tables 3, 4 and 5 and in some Figures. To me, the tables do not convey the results in a clear way. The variables in the tables are not self-explanatory and it is not clear to me if the difference between AIC of variant 1a and 1b in Table 3 is meaningful, just to give an example. Although explained in the text that it is, I do not have a “feel” for the significance of the difference between the two values. And also here, the lack of geological background is felt, as explained earlier.

In section 4 the results are described in a clear way. An overview table with the results

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for the several variants and their significance will be appreciated.

To conclude, the research is important to report, the conclusions are meaningful, but the presentation of both the data and the method can be improved.

Interactive comment on Solid Earth Discuss., 6, 1687, 2014.

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