

## ***Interactive comment on “Estimating sediment thickness by using horizontal distance to outcrop as secondary information” by Nils-Otto Kitterød***

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Received and published: 22 February 2017

The author has written an admirably detailed manuscript of the value of kriging and co-kriging to estimate sediment thicknesses in Norway. I am not overly familiar with the content area, but am familiar with the methodology applied. As such, I have, for the most part, restricted my comments to an assessment of methodology. Below I include several comments that may be useful, but, at the editor's discretion, I see no major impediments to eventual publication.

Page 2, line 5: Typographical error.

Page 2, line 24: Throughout the manuscript the term “significant” is used to mean “large”. I would strongly reserving “significant” to refer to the result of a quantified statistical test. (Other examples are on page 13, line 28, and page 16, line 27.)

C1

Page 3, line 5: While amusing, I didn't quite follow what was meant by “the big 'Zoo' of different methods”.

Page 5, line 14: In my opinion, the removal of 750 sites belongs in the previous paragraph and the final number on line 13 should be revised accordingly.

Page 5, line 15: I found myself debating if this exploratory data analysis was more appropriate as a result. Page 5, line 16: Could the author provide some quantification of the normality of these values? Probability plot correlation coefficients or even probability plots may be useful in highlighting the non-normality.

Page 5, line 22: It is not immediately clear what is meant by “searching windows”. Are these related to the windows discussed on page 7, line 10? Further explanation would be useful.

Page 6, line 24: I think “origin” is more common than “origo”, but it may be a matter of style.

Page 7, line 20: Given the complexity of kriging methods applied, which almost certainly used computer approximations, it seems a bit odd that the author deferred to probability tables rather than using computer approximations.

Page 7, line 27: Please provide some additional discussion of the implications of not reproducing censored observations. How does this relate to over-estimation of low values seen later?

Page 9, line 12: Why was the exponential semivariogram chosen? Were others considered? Given the steepness and short range in Figure 6C, it appears that a constant model might have been more appropriate for the cross-semivariance.

Page 13, line 28: I find this point on over and under-estimation particularly interesting in light of my own work (DOI: 10.1002/2016WR019129). Please do not take this as a request to pad citations; I mention it only to encourage more discussion. Is this an effect of model smoothing? The kriging algorithm, by nature, makes predictions as

C2

linear sums of observations. It is thereby expected that extremes might be moderated by less-extreme values, however smally-weighted, in the summation. Perhaps this is worthwhile discussion, perhaps not.

Page 14, line 1: I did not understand this sentence. Furthermore, by what hypothesis test was the difference determined to be significant?

Page 16, line 32: This paragraph borders on advocacy, a style I tend to shy away from in scientific literature. Furthermore, I think it belittles the purpose of this work: The impact of the manuscript is not in "increase[ing] research on data from GRANADA" but rather a strong demonstration of the usefulness of kriging co-kriging for interpolation of soil characteristics. I would support removing this entire paragraph.

Figures 10 and 11: Not being of the region, I though country outlines would be useful here.

Table 3 and 4: What are the definitions of the cases is not clear to me. Perhaps I missed it, but a description should be in the methods section.

I have not completed a complete editorial review of grammar and style. I notice a handful of typographical errors, but I leave these to copy editing.

Finally, thank you for the opportunity to review this manuscript. It represents a well-written application of kriging. I hope my comments have been useful and can be contacted if any additional information would prove useful.

Thank you,

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., doi:10.5194/hess-2016-658, 2017.