Clim. Past Discuss., 11, C3166–C3169, 2016
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Interactive comment on "Technical Note: Estimating unbiased transfer-function performances in spatially structured environments" *by* M. Trachsel and R. J. Telford

Anonymous Referee #1

Received and published: 10 February 2016

This is a useful statistical-methods paper that builds on prior work by Telford and colleagues. Prior papers established that the h-block approach could reduce the effects of spatial autocorrelation on transfer functions. (If uncorrected, spatial autocorrelation will result in spuriously high estimates of the predictive skill of transfer functions.) This paper establishes three methods for estimating h (the distance within which test samples must be discarded during cross-validation tests) and compares their performance using both simulated datasets with known autocorrelation and real-world datasets.

The paper is well-designed and well-written, so my comments here are all moderate to minor and intended to help strengthen and clarify some of the interesting aspects of

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the paper.

1. I was struck by the estimates of h for the real-world reported in Table 1 – they are larger than I expected. I've always been aware of spatial autocorrelation as an issue with calibration datasets, but I would have thought that the spatial autocorrelation is on the order of 10's of kilometers rather than 100's of kilometers. The results here (300 to 750km) implies a fairly hefty discarding of data – a 750 km radius around a point will remove a lot of data! Suggest adding a short paragraph to the discussion that notes these points and maybe speculates about the ecological or environmental processes that are creating such a large-scale spatial autocorrelation. 2. The abstract and conclusions both emphasize the point that the three methods return the same value of h, but on p 4735, there seems to be a certain amount of fudging going on to ensure that the variance explained approach is returning a value of h that isn't 'excessively large.' A suspicious reader might wonder whether this approach had been tuned to meet the expectations set by the other approaches, and whether this tuning would be robust for other datasets. Maybe a sentence or two addressing this point, in Methods or Discussion, would help. 3. Suggest adding a conceptual or demonstration figure illustrating the three methods summarized on p4732. 4. These recommendations are all for cross-validation tests. Many paleoclimatologists, of course, use transfer functions to make down-core reconstructions of past climatic variables. When going downcore, should paleoclimatologists still apply h-block winnowing, or is this only necessary for cross-validation? 5. 'Spatially independent' – suggest defining this concept explicitly in the ms.

LINE-BY-LINE comments P4730 L13: Suggest adding citation of work of Viau et al., who have been developing pollen-based paleoclimatic transfer functions that are being used by PAGES 2k. e.g. Viau, A. E., Ladd, M., and Gajewski, K. (2012) The climate of North America during the past 2000 years reconstructed from pollen data. Global and Planetary Change 84–85:75-83. P4731 L1-2: "most palaeolimnological transfer functions have little spatial structure in the calibration set, and thus are not affected by this

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problem (Telford and Birks, 2009)." Either modify this statement to make it less sweeping or add references to better support it. T&B2009 only showed that there wasn't much spatial autocorrelation in a single paleolimnological variable (pH) for a single region (NE US). L3-10: Suggest citing Williams & Shuman (2008) – they also employed a simple form of h-block sampling, although they did not use this terminology. P4732 L4: 'gives' -> 'give' L6: delete hyphen (unnecessary for words ending in 'ly' L13-18: This description of the second method doesn't quite connect all the dots. Remind readers of what is the range of a variogram, and what it tells us about autocorrelation and the proper value of h? Clarify also why it's important that the residuals display autocorrelation (last sentence). 4734 L17: 'Spatially independent' – provide more detail about how this spatially independent test set was generated. 4735 L15-22: There seems to be a certain amount of fudging or tuning going on here with the variance explained method... the original method apparently returned 'excessively large' values of h, so the methods were adjusted to return smaller values of h. What is an 'excessively large' value? L20-22: A sum of squares less than 2 is being established as a criteria... has the data been standardized at this point? Or, if not, does this create the problem that different variables and different units would imply different scalings here? 4736: L11-15: Remind reader that these results are for simulated variables. 4738 L6-14: This discussion of spatially independent datasets is good. Suggest defining concept earlier in paper. Also, this discussion is general. Augment this section by discussing whether these problems also apply to the foraminifera dataset used here. 4739 L3-8: This section is generally correct but is blurring a bit the distinction between taxonomic similarity and environmental similarity; specifically it implies that MAT choices are based on environmental similarity. MAT of course is based on taxonomic similarity, so environmental similarity matters only insofar as it determines taxonomic similarity. L23: 'might therefore result in a longer h...' this seems vague, given that paper has just done analyses on this point – what do they show? 4731 L3: 'For the arctic pollen July sunshine transfer function values of h differ' - rewrite, this is hard to read – long string of nouns followed by one verb at end. L5: Delete 'Hence' – incorrectly implies close linkage between this

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sentence and prior one. L8: ‘shorter h’ Shorter than what? And what is a shorter h? Prior sentences implied that all the methods returned roughly similar values of h.

Table 1: Why the “NA” for the Arctic data? Table 1: misspelling of ‘foraminifera’ Figure 1: Clarify that h and range values reported in title are using same units. Figure 2: Explain title for each panel. RMSEP: For what variable and units? Figure 3: Explain title for each panel. RMSEP: For what variable and units? Figure 5: Text on figures is far too small, illegible.

Interactive comment on Clim. Past Discuss., 11, 4729, 2015.