Comment on: "Erroneous Model Field Representations in Multiple Pseudoproxy Studies: Corrections and Implications" by Jason E. Smerdon, Alexey Kaplan and Daniel E. Amrhein

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Smerdon et al. (2010) describe two technical errors in the model grid data used in Mann et al. (2005, 2007a). They are correct in the discovery of these errors. At the same time, we feel that they have not adequately addressed the fact that the main errors not occur in subsequent publications and that the main conclusions of Mann et al., 2007a, which supercedes Mann et al., 2005, are not impacted.

First, Mann et al., 2005 used the Regularized Expectation Maximization method with Ridge Regression (RegEM-Ridge) as a regularization method. RegEM-Ridge has been shown to suffer from a loss of variance when reconstructing the hemispheric mean (Zwiers and Lee, pers. comm., August 2006; Mann et al., 2007a,b; Smerdon and Kaplan, 2007) which is not the case with RegEM-TTLS (Truncated Total Least Squares). This led Mann et al., 2007 to use the TTLS implementation of RegEM. This being the case, we will confine our comments to Mann et al., 2007a. However, it is important that the reader recognize that Smerdon et al. (2010) used RegEM-Ridge and that their results shown in Figure 5(a) show the expected variance loss of a RegEM-Ridge reconstruction whereas RegEM-TTLS faithfully reconstructs the target series (Figure 1).

Smerdon et al. (2010) addresses two issues with GCM field data used in Mann et 2007. The first relates to the GKSS model field. The smoothing issue identified by Smerdon et al. has already been addressed and corrected in a comment/reply sequence (Smerdon et al., 2008 / Rutherford et al., 2008). The main problem appears to be a bug in the particular smoothing algorithm used to convert the GKSS model field to the same resolution as the instrumental field. After seeing Smerdon et al., (2010), further investigation revealed that the "surface" function in The Generic Mapping Tools produces appears to have a bug when run with the default tension setting. Changing the

tension setting, or switching to bilinear interpolation eliminates the problem. Thus, the smoothing problem noted with the GKSS field has been corrected, all GKSS experiments have been re-executed and reinterpreted as necessary, and the results published in Rutherford et al. (2008). Subsquently, we have been alerted to another problem with with the GKSS series (reference the blog post?). In this case the longitudes of the GKSS field were rotated 180° in longitude relative to the instrumental data mask. While the pseudoproxies were drawn from the correct locations relative to the model field, the instrumental data mask was improperly applied. Latitudes are not impacted. Corrected results are shown in Figure 1a and Table 1 and have no impact on the conclusions of Mann et al., 2007.

The second issue relates to the incorrect longitudes for the CSM model field. The authors have correctly identified an error made in converting the CSM field into a format consistent with the available instrumental data so that an instrumental-data mask could be applied. As Smerdon et al. correctly point out, this error does not impact the qualitative conclusions drawn from the results and described in Mann et al., 2007a (cf. Figure 1). The global field was still reasonably sampled, and the pseudoproxy locations, while not correct in longitude, are correct in latitude, and reasonably sample the field. It should also be noted that real proxy locations can vary considerably based on various inclusion/exclusion metrics that accept or reject proxies when building an actual proxy network. In fact, our network "D" in Mann et al., 2007a actually used random pseudoproxy locations.

The authors further note, correctly, that the NINO3 results shown in Mann et al. (2007) are irrelevant as they do not represent the NINO3 region. However, it should also be noted that, though these results were presented in Table 1 of Mann et al., 2007a, they were not discussed. Therefore, the NINO3 issue, though real, it is not significant in terms of the published discussions and conclusions.

It should also be made clear to the reader that two later publications, Mann et al., 2009 (supplemental information table S2), and Rutherford et al., 2010, which used the CSM model field do not suffer from the longitude problem as there was no attempt to apply an instrumental data mask. The results of both subsequent works show the general results and conclusions of Mann et al., 2007a to be robust (Table 1).

In summary, the issues raised by Smerdon et al. (2010), while factual, have no material impact on any of the key conclusions of Mann et al. (2007a). Additionally, they have no impact whatsoever on subsequent studies by us (Mann et al., 2009; Rutherford et al., 2010) where the technical errors they note did not occur, and which reach identical conclusions. In light of these considerations, we are puzzled as to why, given the minor impact the issues raised actually have, the matter wasn't dealt with in the format of a comment/reply. Alternatively, had Smerdon et al. taken the more collegial route of bringing the issue directly to our attention, we would have acknowledged their contribution in a prompt corrigendum. We feel it unfortunate that neither of these two alternative courses of action were taken.

References

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Table 1. Comparison of verification scores for incorrect (grey shading) and correct reconstructions (shown in Figure 1) for both the GKSS and CSM model fields. Results are shown for white noise, signal-to-noise ratio of 0.4, 1900-1980 calibration period, an 850-1899 verification period for CSM and 1000-1899 for GKSS. Additional correct results and discussion can be found in Rutherford et al. (2008), Mann et al. (2009a; supplemental information table S2), and Rutherford et al. (2010).

Model	NH Mean RE	NH mean CE	Multivariate RE	Multivariate CE
GKSS	0.94	0.93	0.68	0.46
GKSS	0.97	0.91	0.30	0.03
CSM	0.96	0.67	0.36	0.04
CSM	0.96	0.70	0.35	-0.04

Data from Mann et al., 2007 and Rutherford et al., 2008; 2010.

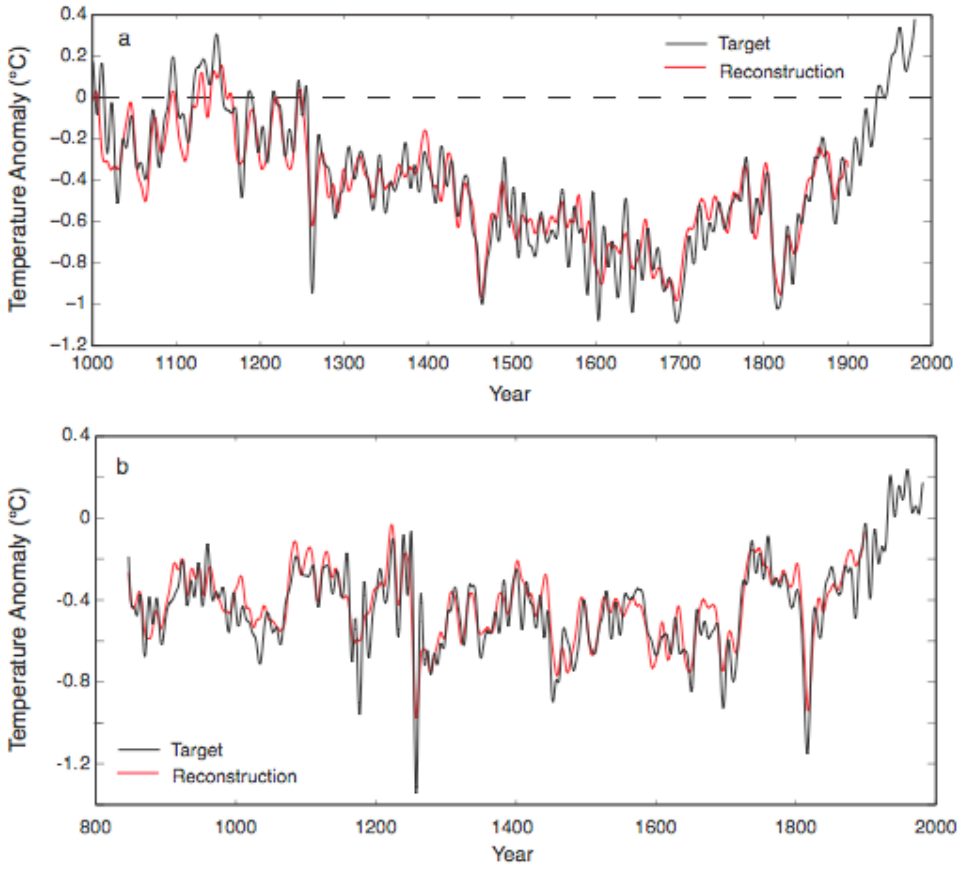

Figure 1. Corrected northern hemisphere mean reconstructions for both the GKSS (a) and CSM (b) model fields as shown in Rutherford et al., 2008 and 2010, respectively. Note that RegEM-TTLS faithfully reconstructs the target series with no observable variance loss. The results shown are for 104 white-noise pseudoproxies with a signal-to-noise ratio of 0.4 and a 1900-1980 calibration period.