**Climate
of the Past
Discussions**

Interactive comment on "Climate of the last millennium: ensemble consistency of simulations and reconstructions" *by* O. Bothe et al.

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We thank the anonymous referee #1 for the presented comments.

We regard the comments as valuable help to optimize the message of our manuscript. A detailed answer to referee #1 and all possible subsequent comments will be presented later in a full reply. This initial reply mainly acknowledges the reviewer's comments and is thought to possibly facilitate further discussions.

The referee's first two comments highlight that we are obviously not clear enough in our writing, so a revised manuscript is going to try to put these points as clearly as possible. This especially holds for the terminology and the direction of construction of our tests.

Obviously there is no estimate of the truth available for the climate of the last millennium. That is, among other things, any verification data set does not only include an observational error, but a larger uncertainty. The definition of a 'true' distribution is meant to describe the distribution from which our (verification) estimate of the past trajectory samples. This definition agrees with that presented in the literature on verification discussions (e.g. Marzban et al., 2010). Our evaluation thus considers the agreement in frequencies (rank histogram) and the quantiles (residual quantiles).

With respect to the referee's comment on the ensemble-mean, we are aware of this problem and are preparing an extension of the analysis to account for these concerns. That is, for the test of the simulation ensemble against the reconstruction ensemble mean we plan to construct estimates of the internal variability by fitting statistical processes against the residuals of the reconstructions relative to the ensemble mean. For the test of the reconstruction against the simulation ensemble mean we are going to add sequences of the long control integration to the ensemble mean. The former case not only considers the internal variability but also the uncertainty in the ensemble estimates.

Thank you for highlighting the final publication of Hind et al. (2012) and Sundberg et al. (2012).

References:

Hind, A., Moberg, A., and Sundberg, R.: Statistical framework for evaluation of climate model simulations by use of climate proxy data from the last millennium – Part 2: A pseudo-proxy study addressing the amplitude of solar forcing, Clim. Past, 8, 1355-1365, doi:10.5194/cp-8-1355-2012, 2012.

Marzban, Caren, Ranran Wang, Fanyou Kong, Stephen Leyton, 2011: On the effect of correlations on rank histograms: reliability of temperature and wind speed forecasts from finescale ensemble reforecasts. Mon. Wea. Rev., 139, 295–310. doi: http://dx.doi.org/10.1175/2010MWR3129.1

Sundberg, R., Moberg, A., and Hind, A.: Statistical framework for evaluation of climate model simulations by use of climate proxy data from the last millennium – Part 1: Theory, Clim. Past, 8, 1339-1353, doi:10.5194/cp-8-1339-2012, 2012.

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