

Interactive comment on “Reconstructing climatic modes of variability from proxy records: sensitivity to the methodological approach” by Simon Michel et al.

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Received and published: 29 November 2018

The study uses one metric to evaluate the quality of the reconstruction methods : the correlation between observed and reconstructed index over a test period. However, other properties of the reconstructed indices may also be relevant, for instance, the variance. Many regression-based reconstruction methods underestimate past variability. This can be illustrated in a simple one-dimensional set up. Considering one proxy record P that reacts to variations of the NAO index:

$$P(t) = \alpha NAO(t) + \epsilon(t)$$

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where ϵ is random noise.

A simple, but widely used, reconstruction method is the statistical regression model:

$$N\hat{A}O(t) = \beta P(t) + \eta(t)$$

where η represents the variability not captured by the regression model. Using Ordinary Least Squares regression to estimate β leads to underestimation of the true value of β and, therefore, of the true NAO variance (see for instance Isobe et al 1990 Linear regression in astronomy for a review of different regression flavours and their properties).

This problem may or not be present in the methods used in this study. It would be useful if the authors could report in Table 4 also the variance of the reconstructed NAO index in the test period wrt. to the observations and also the variance of the reconstructed index over the full period . Also, it would be informative if the time series in figure 11 were not normalized to unit variance (?),but showed the actual reconstructed variability.

Interactive comment on Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2018-211>, 2018.

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