Biases and variance losses in RegEM pseudo-proxy reconstructions for different coupled-model integrations: The impact of standardization procedures

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Comparison of the Mann et al. (1998) and Rutherford et al. (2005) Reconstructions

Contradictory Pseudo-Proxy Results?


Reproduction of the Mann et al. (2005) RegEM Pseudo-Proxy Reconstructions

Smerdon, J.E., and A. Kaplan, Comment on "Testing the fidelity of methods used in proxy-based reconstructions of past climate": The role of the standardization interval, *Journal of Climate*, in review.
**Standardization**: The normalization of a time series by its standard deviation and the centering of a time series by the subtraction of its mean, both over a given interval.
NCAR CCSM Results

Smerdon, J.E., and A. Kaplan, Comment on "Testing the fidelity of methods used in proxy-based reconstructions of past climate": The role of the standardization interval, *Journal of Climate*, in review.
Smerdon, J.E., and A. Kaplan, Comment on "Testing the fidelity of methods used in proxy-based reconstructions of past climate": The role of the standardization interval, *Journal of Climate*, in review.
Mean and Variance of the CCSM Experiments using the R05 and M05 Methods
Comparison of Mean NH Surface Temperature in the NCAR CCSM and GKSS ECHO-G Simulations
GKSS ECHO-G Results using the Drift-Corrected Integration

Mann et al. (2005) Standardization

- Model Mean
- Infinite SNR
- SNR = 0.5
- SNR = 0.25
- SNR = 1.0

Temperature Anomaly (K)

Time (years)
GKSS ECHO-G Results using the Drift-Corrected Integration

Rutherford et al. (2005) Standardization

- Model Mean
- SNR = 0.5
- Infinite SNR
- SNR = 0.25
- SNR = 1.0

Temperature Anomaly (K)

Time (years)
Spatial Correlation between the ECHO-G Simulated and Reconstructed Fields
Implications…
All Spatial Time Series From the Rutherford et al. (2005) Historical Reconstruction
Conclusions

• The Rutherford et al. (2005) formulation of RegEM causes warm biases and variance losses in derived pseudo-proxy reconstructions.

• Differences between the GKSS and NCAR GCMs are not likely sources of large differences between the results of current pseudo-proxy experiments.

• Given real-world constraints, the Mann et al. (2005) pseudo-proxy test used a RegEM formulation that makes it inapplicable.

• The Rutherford et al. (2005) RegEM reconstruction of historical climate is likely an underestimate of past variability from annual to centennial scales, and by comparison, so too is the Mann et al. (1998) result.

• Our results do not invalidate RegEM as a suitable reconstruction technique, but suggest that currently documented results suffer from the shortcomings that we describe.
Acknowledgements

Scott Rutherford
Roger Williams University

J. Fidel Gonzalez-Rouco
Universidad Complutense de Madrid

Eduardo Zorita
Institute for Coastal Research of the GKSS Research Centre

Michael Evans
University of Arizona

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