Supplementary Material:

Correcting for signal attenuation from noise: Sharpening the focus on past climate

Caspar M. Ammann[1], Marc G. Genton[2,3] & Bo Li[1,4]

[1]National Center for Atmospheric Research, 1850 Table Mesa Drive, Boulder, CO 80307-3000, USA. [2]Departement of Econometrics, University of Geneva, Bd du Pont-d'Arve 40, CH-1211 Geneva, Switzerland. [3]Department of Statistics, Texas A&M University, College Station, TX 77843-3143, USA. [4]Department of Statistics, Purdue University, West Lafayette, IN 47907, USA.

Annual reconstruction and increased variance

All reconstructions shown in the main manuscript were performed at full annual resolution of the data, but Figure 2 was smoothed with a 10-year Gaussian filter for illustration of the excellent performance of the reconstruction with regard to bias. As indicated in the text, the trade-off is that the variance at interannual time scales is increased. Fig. S1 shows the raw annual reconstruction result for CPS (blue, panel A) and for the multiple regression (red, panel B) in comparison to the known truth from the NCAR CSM 1.4 simulation (Ammann et al., 2007). The increase in variance is clearly visible, albeit a generally excellent performance even at annual scales. In particular the amplitude of cold years caused by volcanism (see for example years 1258, 1453 and 1815/16) are well captured by the reconstruction, a skill not commonly achieved by many reconstructions (Rutherford et al., 2005; Ammann and Wahl, 2007).

References

Ammann, C. M., Joos, F., Schimel, D. S., Otto-Bliesner, B. L., and Tomas, R. A.: Solar influence on climate during the past millennium: Results from transient simulations with the ncar climate system model, P Natl Acad Sci USA, 104, 3713-3718, 2007.

Ammann, C. M., and Wahl, E. R.: The importance of the geophysical context in statistical evaluations of climate reconstruction procedures, Climatic Change, 85, 71-88, 2007.

Hegerl, G. C., Crowley, T. J., Hyde, W. T., and Frame, D. J.: Climate sensitivity constrained by temperature reconstructions over the past seven centuries, Nature, 440, 1029-1032, 2006.

Rutherford, S., Mann, M. E., Osborn, T. J., Bradley, R. S., Briffa, K. R., Hughes, M. K., and Jones, P. D.: Proxy-based northern hemisphere surface temperature reconstructions: Sensitivity to method, predictor network, target season, and target domain, Journal of Climate, 18, 2308-2329, 2005.

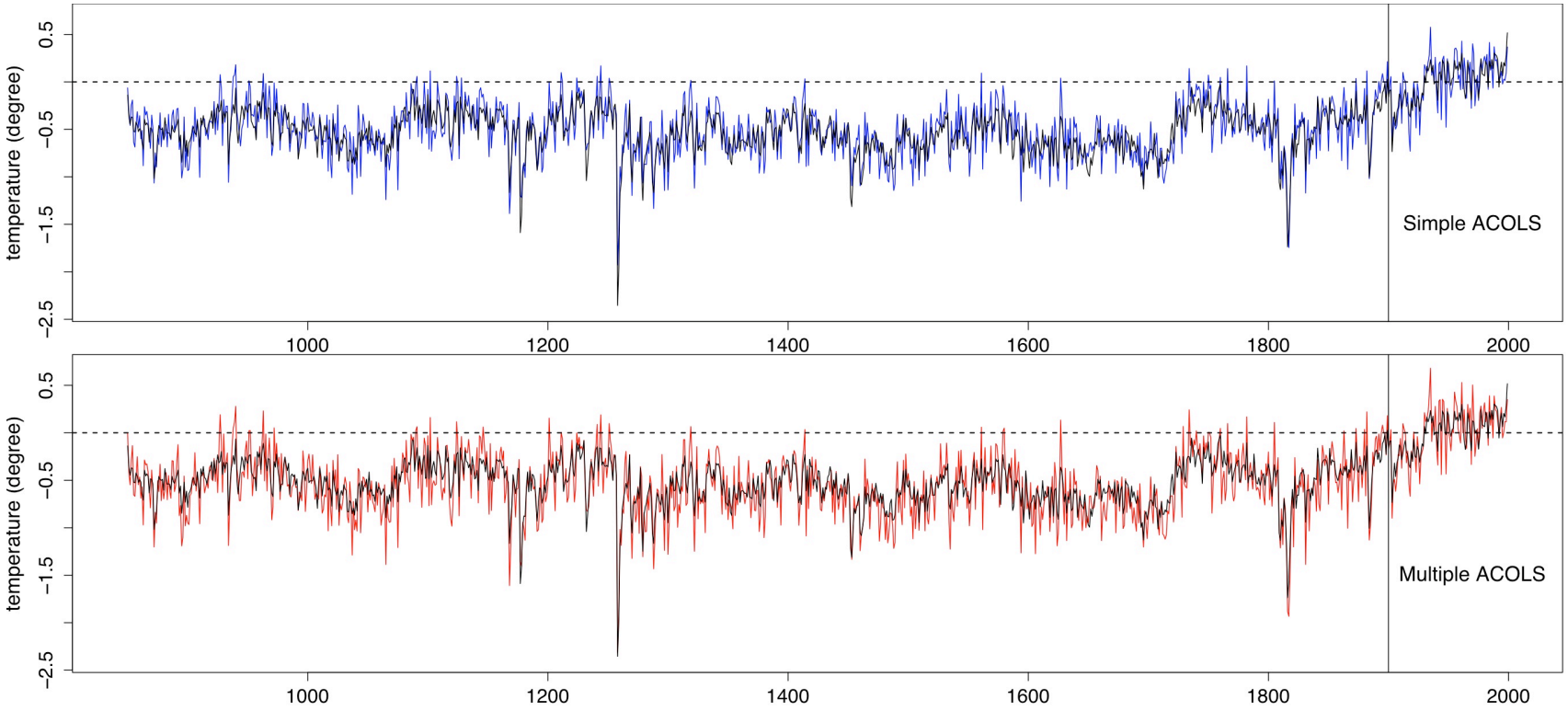

Figure S1: CPS (blue) and multiple (red) regression reconstructions of NH mean temperature using ACOLS based on a network of twelve grid-points – comparable to Hegerl et al.(2006) – here subsampled from output of a coupled GCM (Ammann et al., 2007) where the true climate is known.