

S4E1

Climate Reconstruction Improvements from Iteratively Adjusted Statistics, Demonstrated Using Model SST

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Historical reconstructions of climate fields such as sea-surface temperature (SST) are important for climate studies and monitoring. Reconstructions typically use statistics from a well-sampled base period to analyze sparsely-sampled historical variations in earlier periods. Here a method is shown for adjusting the base-period statistics using the available historical data so that statistics better represent historical variations. The method is demonstrated using SST from a coupled GCM historical run forced by greenhouse gases and aerosols. Simulated data are constructed from the model SST using observed historical SST sampling and adding historical error estimates. The simulated data are reconstructed and results are compared to the error-free and fully-sampled coupled GCM SST to evaluate the reconstruction, and compare results to other methods. Here annual averages are reconstructed. Testing indicates that reconstruction of shorter periods is not improved using the new methods because historical data are only dense enough to improve the leading large-scale modes of variation. Those leading modes explain most of the annual variance, but monthly variations require higher modes that often describe spatial variations too small to be reliably improved by the methods discussed here. The improvements can be important for giving an improved first guess for monthly variations, and for giving more reliable monitoring of multi-decadal changes. In particular, compared to the low-frequency estimate using ERSST methods, the improved analysis better represents variations from the 19th and early 20th centuries when sparse sampling limits where the ERSST method can form reliable low-frequency estimates.

Oral

- **Reconstructing past climates (methods)**