Correction to "Optimal surface temperature reconstructions using terrestrial borehole data"

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INDEX TERMS: 1620 Global Change: Climate dynamics (3309); 3307 Meteorology and Atmospheric Dynamics: Boundary layer processes; 3344 Meteorology and Atmospheric Dynamics: Paleoclimatology; 9900 Corrections; *KEYWORDS:* boreholes, Little Ice Age, surface temperature, signal detection, global warming

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[1] In the paper ''Optimal surface temperature reconstructions using terrestrial borehole data'' by Michael E. Mann, Scott Rutherford, Raymond S. Bradley, Malcolm K. Hughes, and Frank T. Keimig (*Journal of Geophysical Research*, *108*(D7), 4203, doi:10.1029/2002JD002532, 2003), an error was made with respect to the normalization of the grid box weights used to form an areal hemispheric mean series (as pointed out by *Pollack and Smerdon* [2004]). The error led to an underestimate of the amplitudes of hemispheric mean trends by a factor of 1.47. The correction leads to a minor change in the ''optimal'' hemispheric mean trend and a more substantial change in the larger trend in the simple areally weighted grid box mean series. The grid box temperature series, principal components (PCs) series, and empirical orthogonal functions (EOFs) are correct as shown previously.

[2] The corrected versions of Figures 6 and 7 are shown here. The primary conclusions stated by *Mann et al.* [2003] (hereinafter referred to as M03) stand with some minor revision:

[3] 1. The ''optimal'' borehole hemispheric surface air temperature (SAT) trend is slightly greater in amplitude than shown by M03, with about 0.1°C greater cooling back in time. The optimal estimate is nonetheless only modestly colder than various other proxy-based SAT reconstructions and instrumental estimates in past centuries and is consistent with them well within the mutual uncertainty estimates (Figures 6 and 7).

[4] 2. The areally weighted, gridded borehole data display a smaller trend (Figure 6) than the simple composite of *Huang et al.* [2000]. The trend is larger, however, than that shown originally by M03, with about 0.2°C greater cooling back in time. The trend is thus closer in amplitude to the *Huang et al.* [2000] estimate than shown previously. Gridding and areally weighting thus appear to be less of a factor in resolving differences between borehole and other proxy-based estimates than might have been inferred from M03.

References

Huang, S., H. N. Pollack, and P.-Y. Shen (2000), Temperature trends over the past five centuries reconstructed from borehole temperature, *Nature*, *403*, 756–758.

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Pollack, H. N., and J. E. Smerdon (2004), Borehole climate reconstructions: Spatial structure and hemispheric averages, *J. Geophys. Res.*, *109*, D11106, doi:10.1029/2003JD004163.

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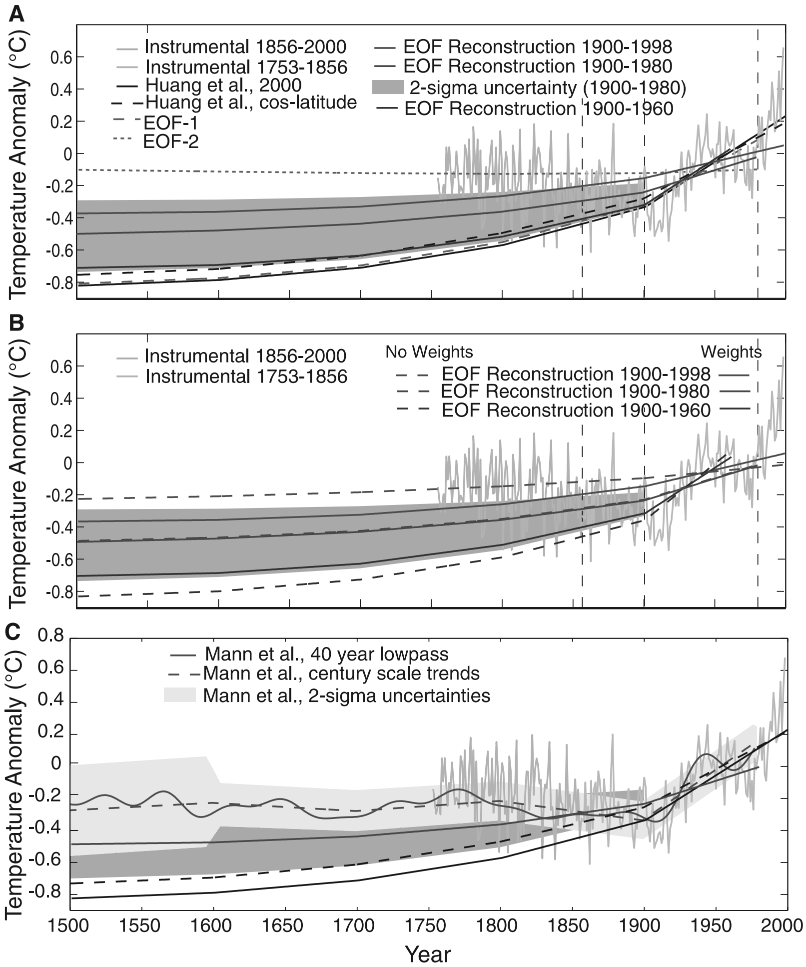

Figure 6. Borehole-based reconstructions of Northern Hemisphere mean temperature compared with instrumental Northern Hemisphere annual mean surface temperature (*Jones et al.* [1999]; light gray) extended to mid 18th century with the available instrumental data (see text; light blue-gray). (a) HPS00 Northern Hemisphere temperature reconstruction compared to areally weighted mean of gridded HPS00 borehole reconstructions, and optimal borehole hemispheric SAT estimate (using 1900–1960, 1900–1980, and 1900–1998 projection intervals). The 95% confidence interval (light green shading) is also shown for the reconstruction corresponding to the 1900–1980 projection interval. Also shown are the separate projections of the first two eigenvectors onto hemispheric mean temperature. (b) Comparison of the optimal borehole SAT estimate for the unweighted and weighted borehole grid point GST reconstructions. (c) Comparison of HPS00 reconstruction, areally weighted mean of gridded HPS00 borehole reconstructions, and the optimal borehole estimate (based on 1900–1980 target instrumental signal; 95% confidence interval also shown) with *Mann et al*. [1999] reconstruction (latter shown both as smoothed (40 year lowpassed) annual values, and piecewise continuous linear trend estimate with its associated 95% confidence interval). See color version of this figure in the HTML.

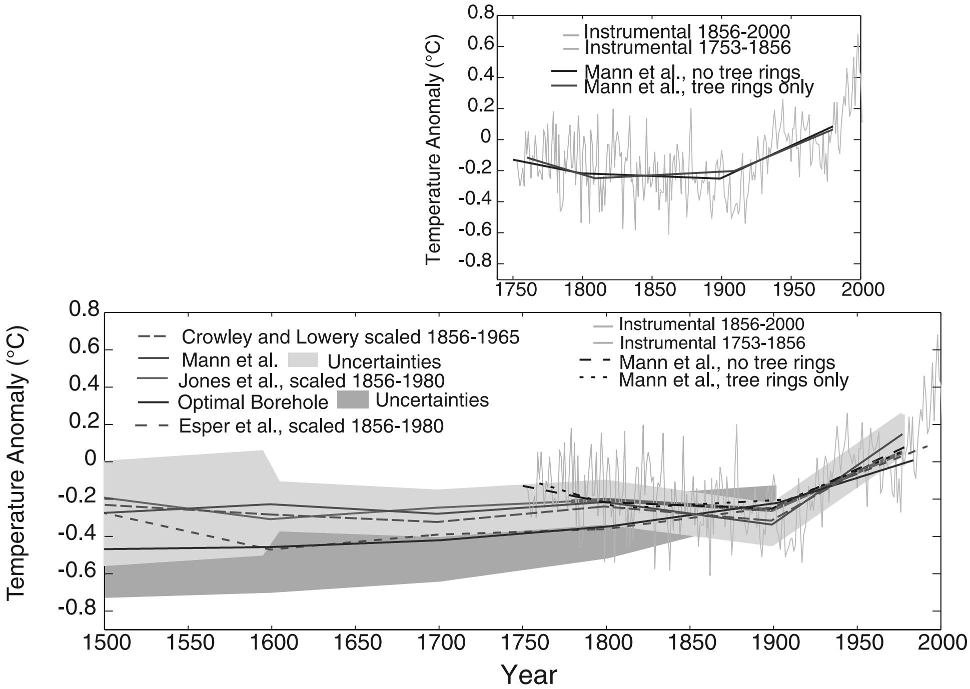

Figure 7. Comparison of optimal borehole reconstruction (based on 1900–1980 target instrumental signal; 95% confidence interval shown) with piecewise continuous linear trends fit to various proxy-based hemispheric temperature reconstructions. The *Jones et al*. [1998] and *Esper et al*. [2002] extratropical summer temperature reconstructions have been scaled to the full Northern Hemisphere 1856–1980 annual mean. All other proxy-series shown are based on original published calibrations, but aligned to a 1961–1990 reference period mean. Note that the Mann et al. only tree ring and only nontree ring reconstructions are only available back to 1750 [see *Mann et al.*, 2000]. See color version of this figure in the HTML.