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DISCUSSION OF: A STATISTICAL ANALYSIS OF MULTIPLE TEMPERATURE PROXIES: ARE RECONSTRUCTIONS OF SURFACE TEMPERATURES OVER THE LAST 1000 YEARS RELIABLE?

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1. Introduction. It is a pleasure to have the opportunity to read and comment on McShane and Wyner's paper, "A statistical analysis of multiple temperature proxies." This is a must read for every statistician who has an interest in the climate change debate that continues to be a source of intense public policy discussions. The authors are to be congratulated for writing a clear and accessible article that helps decipher the statistics behind the scientific claims related to the paleoclimatological side of the issue.

We will focus our discussion on some of the points dealing with the time series modeling aspects. The main objectives presented in this paper are strategies for selecting and evaluating predictive models of average yearly temperature that include nearly 1200 proxies. For the sake of this discussion, we will concentrate on the response consisting of the CRU Nothern Hemisphere annual mean land temperature (upper-left panel of Figure 5 in the paper) from 1850 to 1999. Roughly, one can discern three or possibly four segments in this time series: the first from 1850 to 1920 with nearly constant mean, the second from 1921 to 1970 with a mean that is increasing slightly, and the third from 1971 to 1999 with a sharply increasing mean. This is roughly consistent with the three segments found by the segmentation program AutoPARM, developed by Davis, Lee anf Rodriguez-Yam (2006). If we let $Y_1, \ldots, Y_{150}$ denote the temperature data during these 150 years, 1850–1999, the differenced series $\nabla Y_t = Y_t - Y_{t-1}$ and its autocorrelation function (ACF) are plotted in the upper-left and right panels of Figure 1. The differenced series looks stationary and the ACF has a spike of -0.5 at lag 1, has small values for lags 2 and 3 and is essentially 0 for lags greater than 4. This ACF has the signature of a classical moving average time series with a unit root. Such an ACF suggests a model that takes the form

$$Y_t = X_t + Z_t,$$

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