

## Supplementary Information #1

### PCA Analysis of North American ITRDB Data (70 Series available back to 1400)

a. Eigenvalue spectrum for MBH98 PCA analysis (1902-1980 zero reference period, data normalized by detrended 1902-1980 standard deviation):

Rank	Explained Variance	Cumulative Variance
1	0.3818	0.3818
2	0.0976	0.4795
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3	0.0491	0.5286
4	0.0354	0.5640

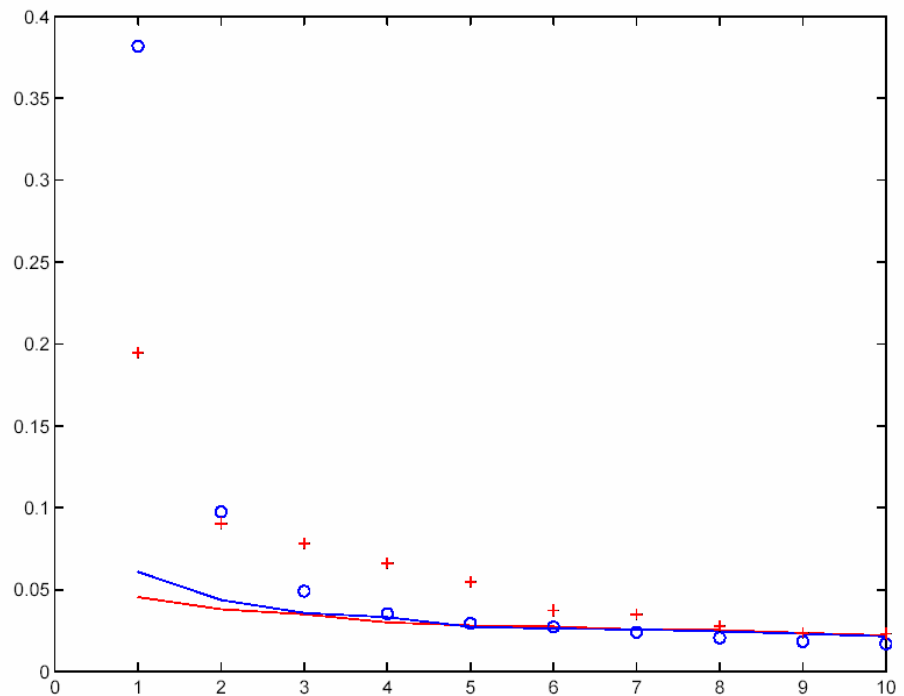
First 2 PCs were retained based on selection rules of MBH98 (see Figure 1)

b. Eigenvalue spectrum for PCA analysis Based on Convention of MM04 (1400-1971 zero reference period, data unnormalized)

Rank	Explained Variance	Cumulative Variance
1	0.1946	0.1946
2	0.0905	0.2851
3	0.0783	0.3634
4	0.0663	0.4297
5	0.0549	0.4846
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6	0.0373	0.5219

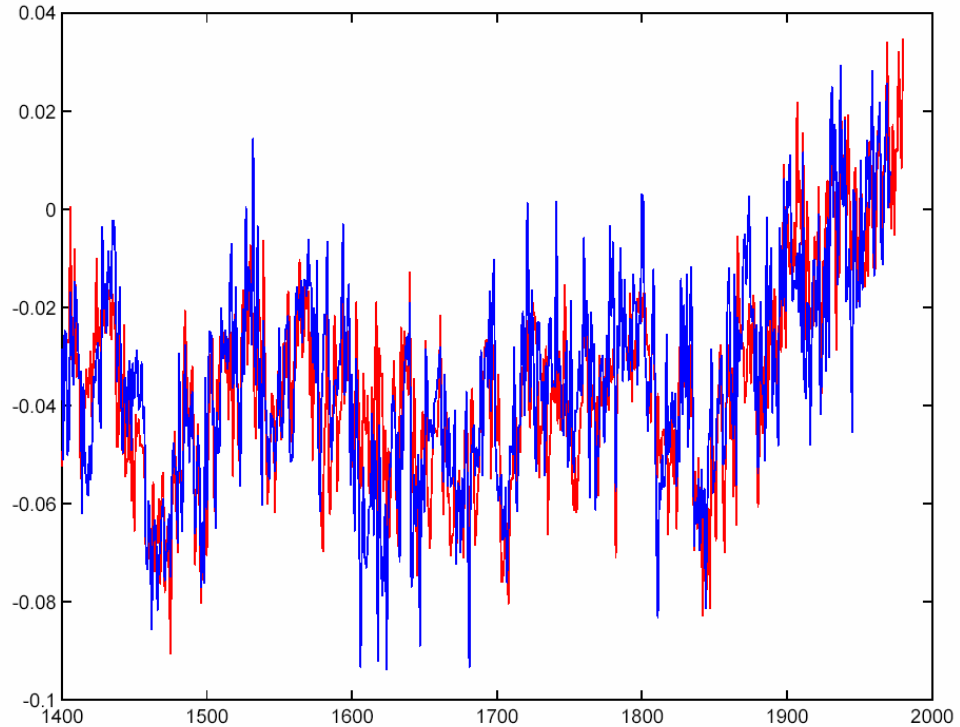
5 PCs should be retained in this case using the selection rules of MBH98 (see Figure 1).

**FIGURE 1.** Comparison of eigenvalue spectrum for the 70 North American ITRDB data based on MBH98 centering convention (blue circles) and MM04 centering convention (red crosses). Shown is the null distribution based on simulations with 70 independent red noise series of the same length with the same lag-one autocorrelation structure as the actual ITRDB data using the centering convention of MBH98 (blue curve) and MM04 (red curve). In the former case, 2 (or perhaps 3) eigenvalues are distinct from the noise floor. In the latter case, 5 (or perhaps 6) eigenvalues are distinct from the noise floor. The simulations are described in "supplementary information #2".



MM04 (incorrectly) retained only the first 2 PCs, which eliminates the *dominant pattern of low-frequency variability* in the 70 series dataset, which appears as PC#4, rather than PC#1, in this case. This PC is nearly identical to ITRDB PC#1 of MBH98 (Figure 2) and therefore that pattern cannot possibly, as argued by MM04, arise as an artifact of the standardization procedures used by MBH98. The change in choice of reference period, which changes the centering of the data, simply changes the rank, in relative variance explained, of the few leading patterns of variance in the data.

**FIGURE 2.** Comparison of ITRDB PC #1 from MBH98 (red) and PC #4 resulting from a PCA Analysis using the MM04 centering convention (blue-- for visual comparison the blue curve has been adjusted to have the mean and amplitude of the red curve).



The MBH98 reconstruction was then performed using the MM04 PCA convention to represent the North American ITRDB data, but retaining the first 5 PCs (which follows from the selection protocol of MBH98-see above). A 1902-1971 calibration interval was employed to avoid any missing data, and the 'Gaspé' series challenged by MM04 was eliminated. The resulting NH mean reconstruction is broadly consistent with that of MBH98 (Figure 3), though with a somewhat lower verification resolved variance ( $RE=0.22$  rather than  $RE=0.51$  for MBH98).

**FIGURE 3.** Reconstruction of AD 1400-1600 interval retaining first 5 PCs of North American ITRDB data using MM04 centering convention (red), along w/ MBH98 reconstruction (blue).

