More on Hockey Sticks: the Case of Jones et al [1998]

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A1. Was the Medieval Warm Period warmer than the mid-20th century? Jones et al (1998) and other "spaghetti graphs."

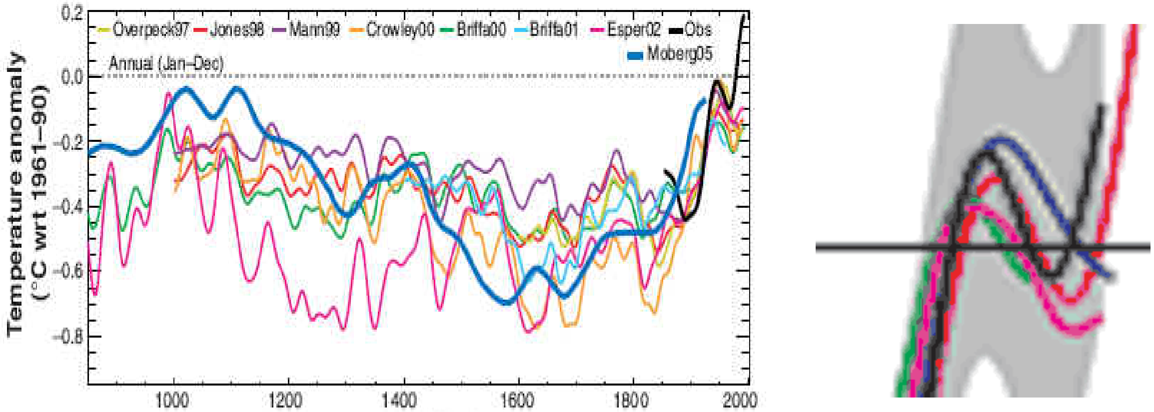

Figure 1. Left - Millennial reconstruction spaghetti graph from Kerr [Science, 2005]; right – detail from IPCC spaghetti graph showing truncation.

Although multiproxy studies, as illustrated in Figure 1, do not seem to agree on almost any detail, they are said to agree on one critical point: Medieval Warm Period (MWP) temperatures are supposedly less than mid-20th century temperatures. Their logic is then: instrumental comparisons show that late 20th century temperatures are higher than mid-20th century temperatures; ergo, late 20th century temperatures were millennially high. However, despite all the money spent on climate science, all of these studies, including the most recent [Moberg et al, 2005] continue to rely on proxies collected up to 25 years ago, with no attempt to validate that the proxies are capable of recording warm decades like the 1990s. Briffa et al [2001] fails so badly after 1960 that its last portion was excised from the IPCC and subsequent spaghetti graphs.

In McIntyre and McKitrick [2005], we examined the most famous of these - the hockey-stick reconstruction of Mann et al. [1998, 1999] (MBH98-99) (**maroon)**, used iconically by IPCC and showed, among many problems with this study, that MBH98 hockeystick-ness depended on two proxies known in specialist literature not to be temperature proxies (bristlecones and a Jacoby cedar series) and that both proxies were overweighted through questionable methodologies.

Here I show that the reconstruction by Jones et al. [1998] **(red)**, which is prominent in IPCC and all other spaghetti graphs, *as with MBH99, is fundamentally non-robust and cannot be used to conclude that late 20th century climatic conditions are unusual in the millennial context,*. and that there are major problems in two underlying proxies series (Polar Urals and Tornetrask), which, together with the problematic bristlecones, are repetitively used in other multiproxy studies, pointing to potential systemic problems in the field and the need for careful scrutiny of each such study.

A2. Modern Warmth in Jones et al [1998] Relative to the MWP Depends on One Proxy: Briffa's Polar Urals

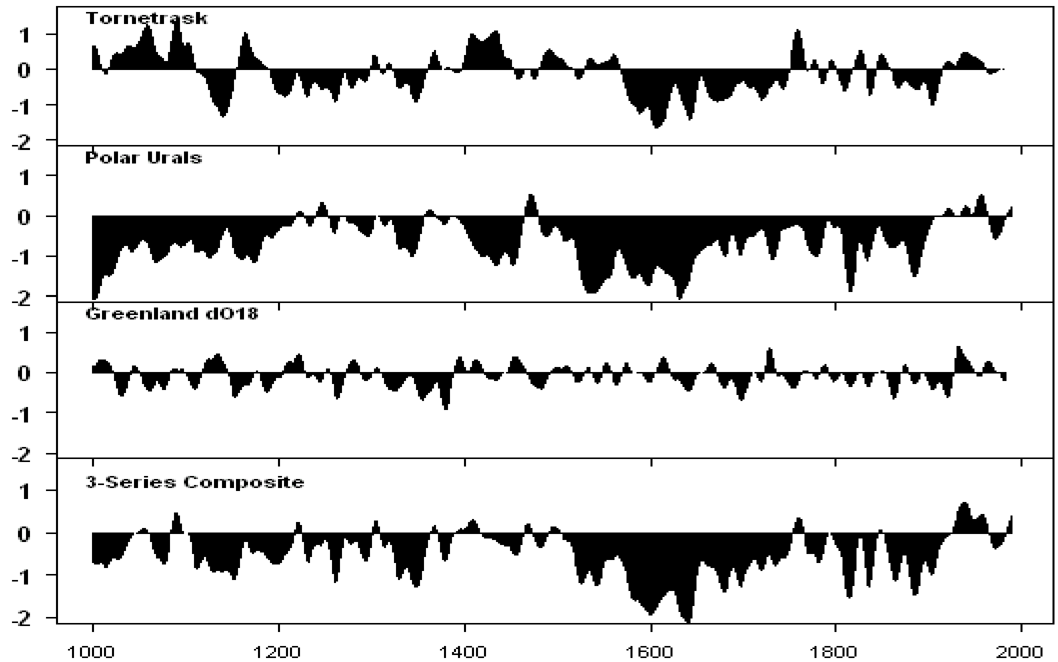

Figure 2. The Three Eleventh Century Proxies from Jones et al [1998] and Average.

Jones et al [1998] has only 3 (!) proxies in the controversial early 11th century. Two of them are non-arm's length reconstructions from tree rings at Tornetrask [Briffa et al , 1992] and Polar Urals [Briffa et al., 1995], and an ice core O18 series from Greenland [Fisher et al., 1996]. A 4th proxy starts in 1073 and a 5th does not begin until 1400. There are 10 proxies starting only in the 17th century.

The 3-series composite shows 11th century values lower than 20th century values, but this is due **entirely** to the impact of Briffa's Polar Urals reconstruction (panel two). The Tornetrask temperature reconstruction has a "warm" MWP, as well as in the early 15th century. The Greenland dO18 stack proxy shows relatively little centennial-scale variability. None of the three proxies closes the 20th century at exceptional levels. However, Briffa et al [1995] claimed that 1032 was the "coldest year" of the millennium. The rescaled composite has a hockey stick shape and a depressed MWP, due to the impact of the Polar Urals series.

Jones et al. [2001] claimed standard errors for their MWP portion of approximately 0.15 deg C., but this depends on the validity of only 3 proxies.

The Polar Urals reconstruction and/or data is used in other multiproxy studies (**Bold** in Fig 1): Bradley and Jones [1993], Hughes and Diaz [1994] (both in an earlier version), **Overpeck et al [1997]**, **MBH98-99**, **Crowley and Lowery [2000]**, Jones and Mann [2004], **Briffa et al [2001]** and **Esper et al [2002]**. The Tornetrask reconstruction is used in all of the above plus a couple of others. The supposedly "independent" studies in the spaghetti graph actually rely on repeated use of the Polar Urals and Tornetrask (in addition to bristlecones).

A3. Are Jones et al (1998)'s proxies representative? Independent Views of the Polar Urals

In contrast to Briffa's finding of exceptional MWP coldness in the Polar Urals, Shiyatov [1995] reported:

> *From the middle of the 8th to the end of the 13th, there was intense regeneration of larch and the timberline rose up to 340 a.s.l. The 12th and 13th centuries were most favorable for larch growth. At this time the altitudinal position of the timberline was the highest, stand density the biggest, longevity of trees the longest, size of trees the largest, increment in diameter and height the most intensive as compared with other periods under review.*

Naurzbaev et al. [2004] also reported elevated MWP temperatures in central Siberia:

> *trees that lived at the upper (elevational) tree limit during the so-called Medieval Warm Epoch (from A.D. 900 to 1200) show annual and summer temperature warmer by 1.58 and 2.3 deg C, respectively, approximately one standard deviation of modern temperature. Note that these trees grew 150–200 m higher (1–1.2 deg C cooler) than those at low elevation but the same latitude, implying that this may be an underestimate of the actual temperature difference.*

It is strange that the site which largely eliminates the MWP from so many multiproxy studies has, independently, been shown to have experienced exceptional warmth over that interval. Are there quality control or homogeneity problems at Polar Urals that could account for this?

Figure 3 (below) shows two aspects of Polar Urals non-homogeneity. The top panel shows increasing average age; the bottom panel shows decreasing altitude. Briffa et al. [1995] adjusted for age, but not for altitude.

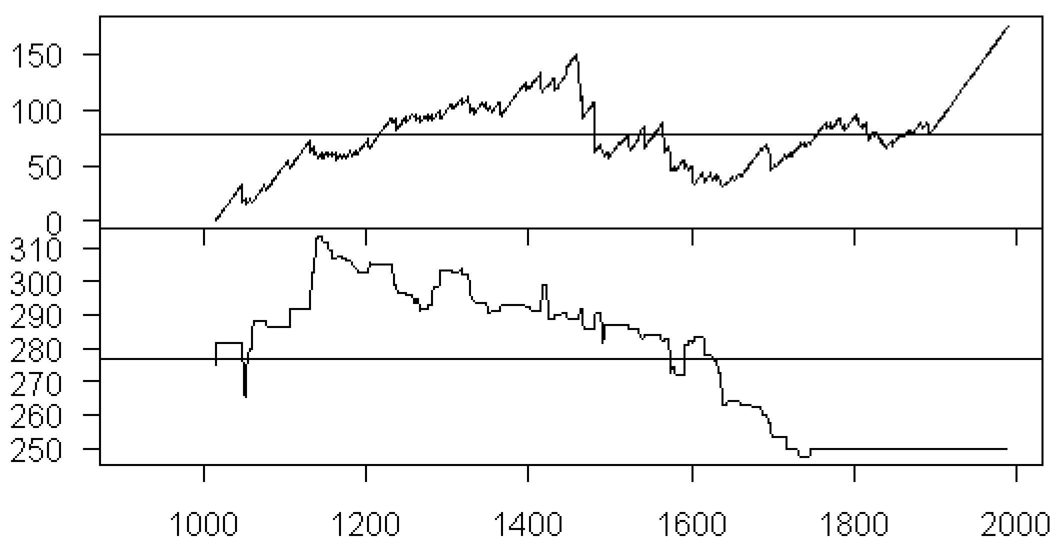

Figure 3. Top - Average age of Polar Urals samples; bottom - average altitude of Polar Urals samples.

B1. Briffa's Polar Urals Series - A Critical Quality Control Failure

- Standards in dendrochronology call for a minimum 10 cores for RCS. There are only 2-4 (!) tree cores in Briffa et al [1995] prior to 1050. Because cores are short (average 150 years), risks from quality control defects are particularly great.
- There is strong evidence that 3 of the 4 cores (862450, 862460 and 862470) in the early 11th century reconstruction have been misdated.
  - Cores are highlighted as potentially problematic in a COFECHA run;
  - the dating is out of sequence relative to cores with adjacent identification numbers;
  - t-statistics using methodology from Wigley et al [1987] fail significance tests.

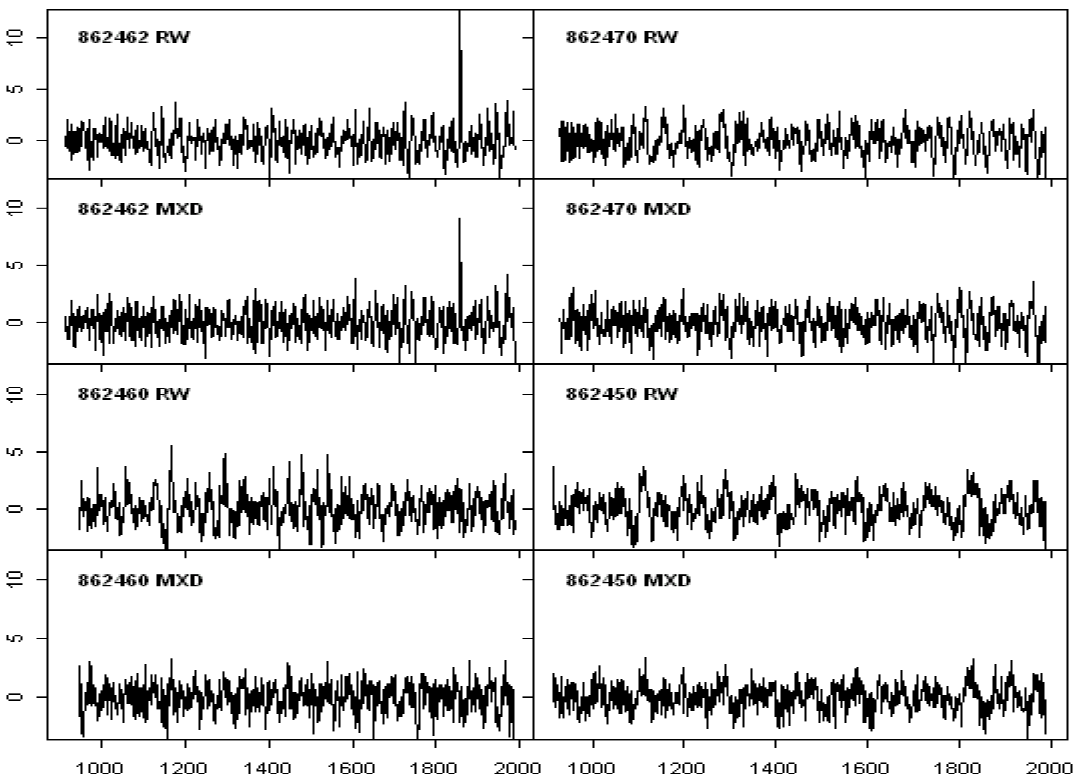

Figure 4. Rolling t-statistics for one modern well-dated core and the three controversial cores. The well-dated core has a distinct upspike at the assigned starting date. There is no upspike for the questionable cores.

CONCLUSION: The early (pre-1100) portion of Polar Urals is unreliable and should not be used.

B2. Problematic Adjustments at Tornetrask

Briffa et al. [1992] observed a declining MXD (density) trend at Tornetrask in the 20th century. Declining MXD values have turned out to be pervasive in other sites after 1960. So Briffa et al. simply coerced the Tornetrask MXD series upwards (panel 2). This declining MXD trend has been observed in other series [Briffa et al 2000]. For nearly 10 years, Briffa has hypothesized an "unknown anthropogenic" cause. It is quite possible that MXD series simply do not record warmer events and therefore become an unreliable for comparing MWP (using MXD) and modern (using instrumental) periods

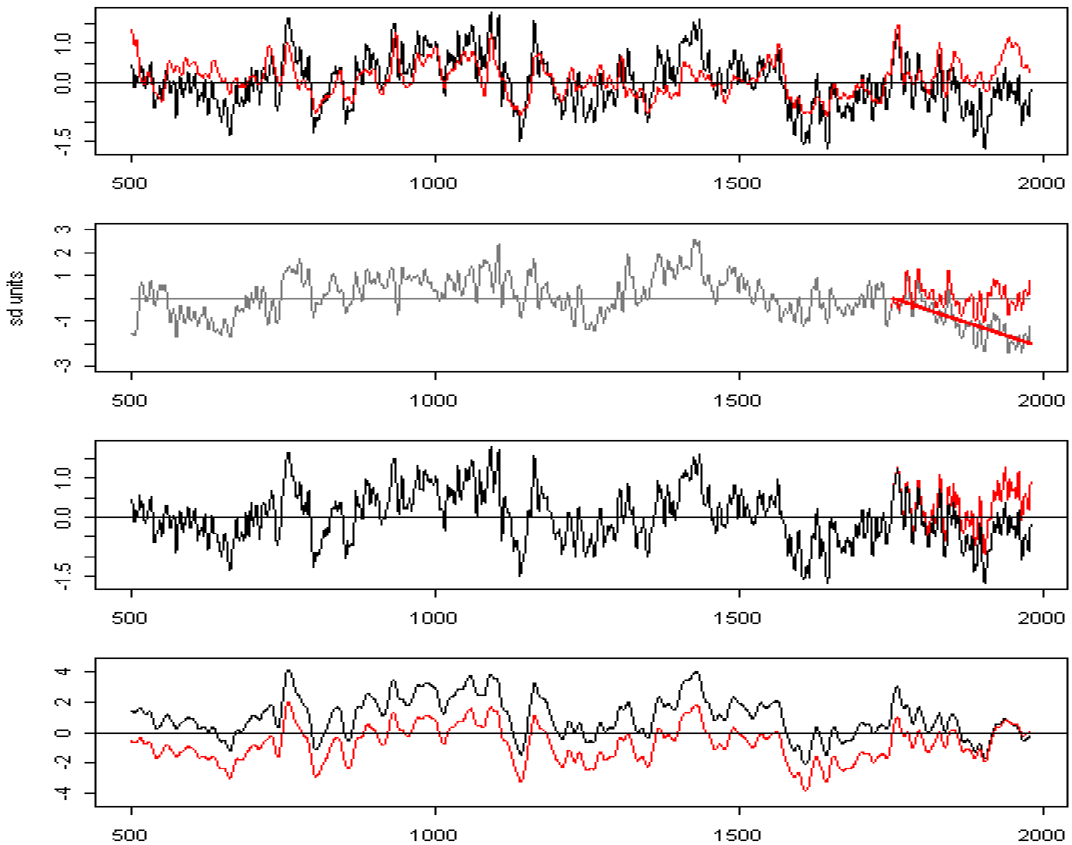

Figure 5. Top: Tornetrask ring width (RW) (red) and MXD (black) chronologies. Second (compare to CD92 Figure 7): Black - residuals after regressing MXD against RW over 500-1750 interval; red line - "trend" of residuals after 1750; red - "adjusted" residuals (25-year Gaussian smooth), scaled to sd units of the residuals. Third - "adjusted" MXD chronology after adding back "adjusted" residuals, centered on the 500-1980 mean of the unadjusted chronology. Bottom panel - MXD chronologies with 1902-1980 zero (additional 25-year smooth). Black - unadjusted; red - "adjusted". Note the change in relative position of 20th century.

CONCLUSION: This data modification is ad hoc, influential and unjustified

B3. The Bottom Line: Jones et al. [1998] cannot robustly assert that the mid-20th century is warmer than the MWP

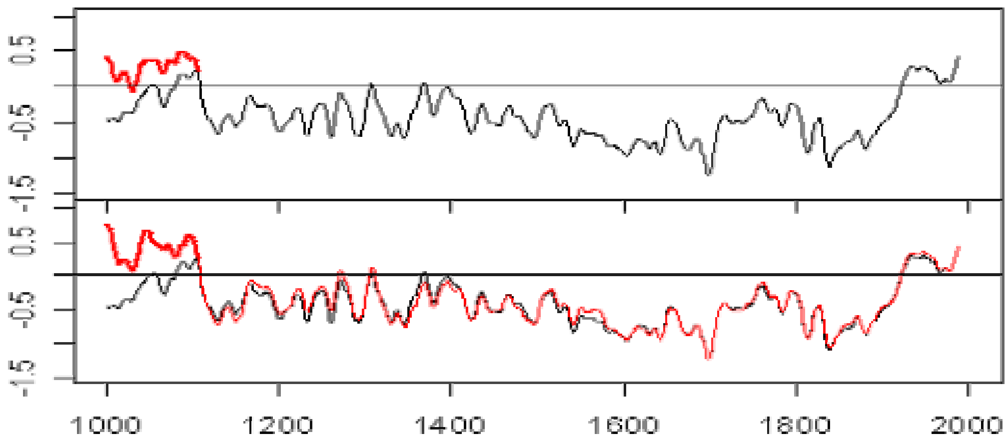

Figure 6. Jones et al [1998] Proxy Emulation. Top – shows removal of 3 poorly dated Polar Urals cores prior to 1100; bottom – combined effect of removing 3 poorly dated cores and removing ad hoc Tornetrask adjustment.

Simply by removing the 3 invalid cores and backing out the unwarranted modification to the Tornetrask MXD adjustment, *the Jones 1998 conclusion of late 20th century climatic uniqueness is overturned*. In other words, the conclusions depend on placing three undatable cores out of sequence into the 11th century and arbitrarily repositioning the 20th century Tornetrask MXD series. The conclusions are fundamentally non-robust.

Jones et al. [2001] claimed a standard error for the smoothed series of 0.15 deg C. The presence/absence of 3 (incorrectly) dated cores at the Polar Urals results in differences of up to 1 deg C. contradicting the claimed confidence intervals. These trivial adjustments do not account for altitude changes.

Splicing the instrumental record cannot be justified until it demonstrated that the proxies record warm temperatures like the 1990s.

There are many other problems with other proxy series used in these studies: non-normality; lack of disclosed selection protocols; merger of instrumental and proxy records. However, the problems reported here, together with bristlecone problems identified in MM05, affect others:

- Crowley and Lowery [2000] use 15 series: including Polar Urals, Tornetrask and two bristlecones series;
- Esper et al. [2002] uses Polar Urals, Tornetrask and two foxtail series;
- Moberg et al [2005] uses Tornetrask and 3 bristlecone series (although more critical issues lie elsewhere).

None of the claimed confidence intervals can be relied upon and none of the results are secure.

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