Savonarola @detgodehab

Mar 17 · 17 tweets

(1/17) A fact-checker told me that Wahl & Ammann 2007 used the same proxy data as MBH98. Let's see if this is TRUE or FALSE.

This Python script generates most of the figures in this thread (and downloads ~150 MB of data): pastebin.com/06pKtnQh

(2/17) The MBH98 temperature reconstruction and the WA emulation of it span the period AD 1400–1980 and are concatenations of a dozen or so shorter reconstructions, each using a separate network of available proxies. These notes will focus on the earliest interval (AD 1400–1449).

(3/17) Now for the good stuff: linear algebra. 🤓 Skip to tweet 6 if you don't like equations.

Variables:

P: proxy data matrix.
P_0: calibration submatrix of P.
$T \approx U\Sigma V$: low-rank approximation of observed temperature field.

(4/17) The methods description in MBH98 is a little wordy but amounts to this:

Regression model: $P_0 = UG + E$
Calibration: $\hat{G} = (UU)^{-1}UP_0$
Reconstructed U: $\hat{U} = P\hat{G}(\hat{G}\hat{G})^{-1}$
Reconstructed T: $T = \hat{U}\Sigma V$

(5/17) So the reconstructed temperature field is $T = P\hat{G}(\hat{G}\hat{G})^{-1}\Sigma V$, and the Northern Hemisphere mean (the "hockey stick") is a weighted mean of T. The useful thing to note here is that the temperature reconstruction is a linear combination of the proxy records.

(6/17) WA used proxy data from this archive: meteo.psu.edu/holocene/publi…

If MBH98 used the same data, then the MBH98 reconstruction would be a linear

combination of this data. It's easy to see that this is not the case by regressing the reconstruction on the proxy data.

MBH98 reconstruction regressed on WA proxy data
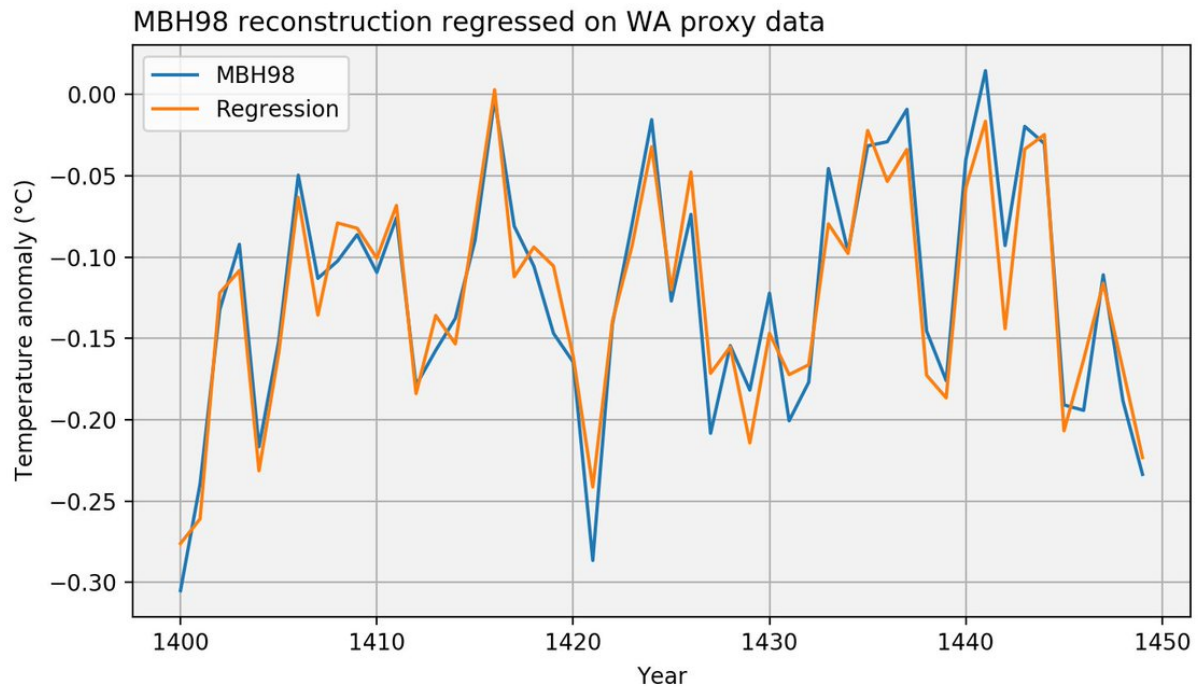
(7/17) The regression shows the closest WA could have hoped to emulate MBH98 with the data they used. The actual emulation is much less accurate.

MBH98 and WA reconstructions
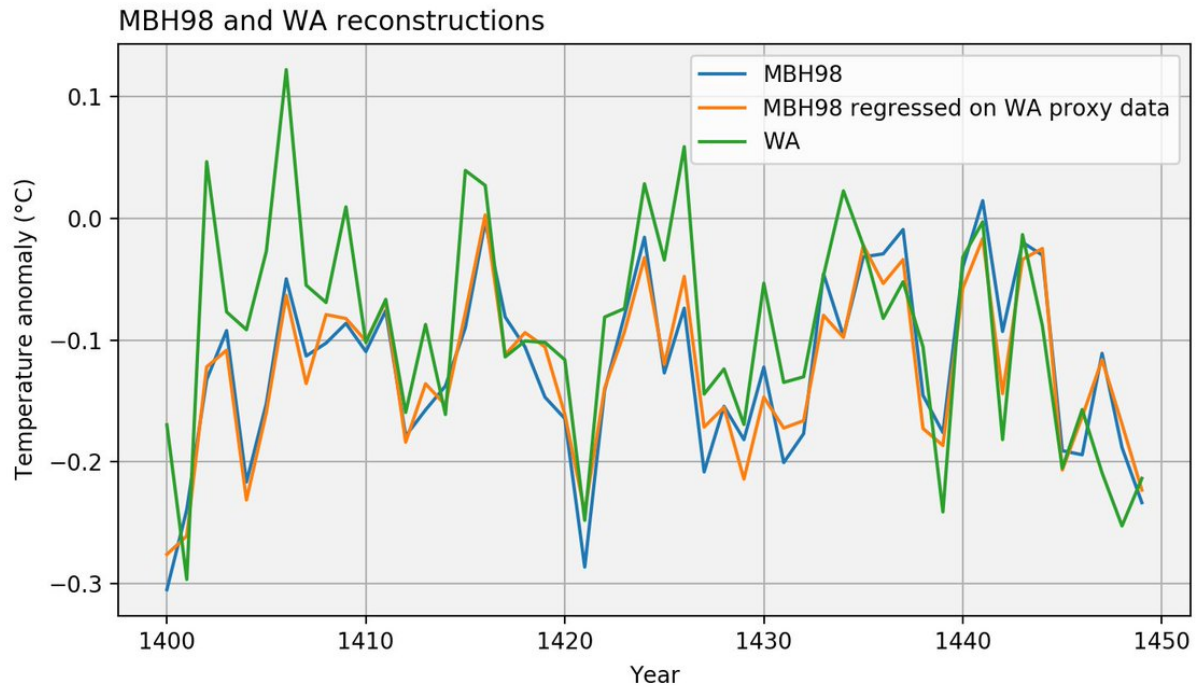
(8/17) Just to check that the code works, here's the WA reconstruction regressed on the WA proxy data. It's an exact fit, as expected.

WA reconstruction regressed on WA proxy data
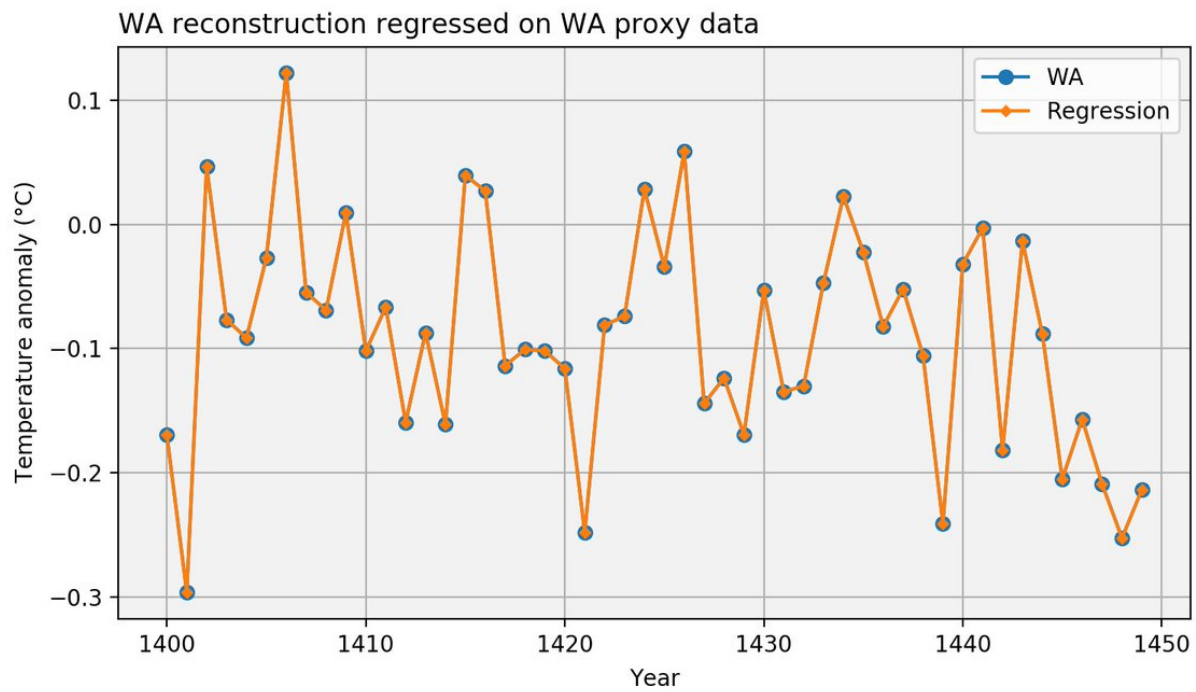
(9/17) To determine what proxy data was really used in MBH98 we need the larger Climategate dataset, hosted here by @ Dave Burton : sealevel.info/FOIA/2009/OIA…

The proxy data used in WA is a subset of the Climategate data.

Index of /FOIA/2009/FOIA/documents/mbh98-osborn

| Name	Last modified	Size	Description
Parent Directory		-	For additional information about Climategate, see the SeaLevel.info Climategate webpage, and: BishopHill, Steve McIntyre (also here & here), Tom Nelson, Michael Kelly, Richard Muller, WUWT
CORAL/	2000-05-22 14:56	-	
HIST/	2000-05-22 14:56	-	
ICE/	2000-05-22 14:56	-	
INSTR/	2000-05-22 14:56	-	
OLD/	2000-05-22 14:56	-	
PCS/	2000-05-22 14:56	-	
TREE/	2000-05-22 14:56	-	
gridpoints.loc	2004-06-29 05:07	37K	
iterfit.pro	2003-08-01 09:59	926	
mann_nh1000.dat	2000-12-19 08:02	20K	
mann_nh1400.dat	2000-12-19 08:02	43K	
mann_nherr1000.dat	2000-12-19 10:38	53K	
mann_tderr.idlsave	2004-07-05 10:26	1.9K	
mbh98.tar	2000-10-17 14:48	22M	
mkresidual1820.pro	2003-08-22 06:32	1.3K	
mkuncert.pro	2003-08-29 10:59	10K	
mkuncert.pro.old	2003-08-13 11:32	8.8K	
nh-ad1000-resid.dat	2003-07-31 11:35	3.3K	
nh-ad1400-resid.dat	2003-07-31 11:35	3.3K	

(10/17) Redoing the regression analysis with all 15 North American ITRDB PCs included yields a match. The regression coefficients reveal that the first six PCs were used in MBH98, whereas WA only used the first two PCs. Conversely, some proxies used in WA were not used in MBH98.

MBH98 reconstruction regressed on Climategate proxy data
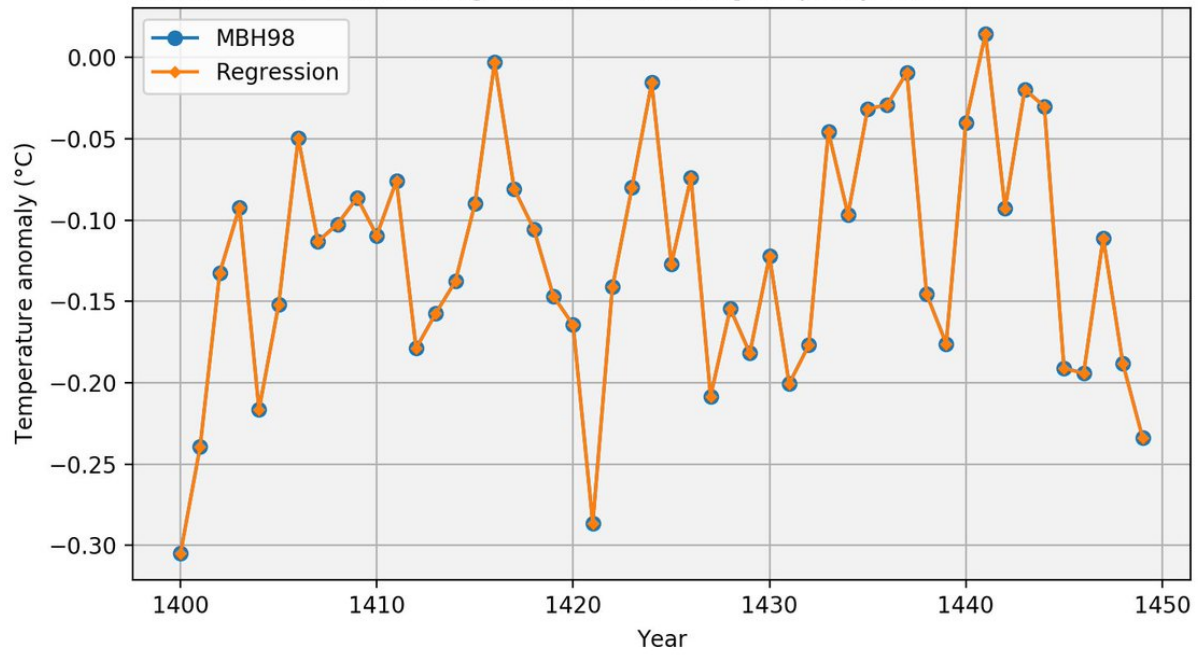
WA regression coefficients
AD 1400–1449 interval
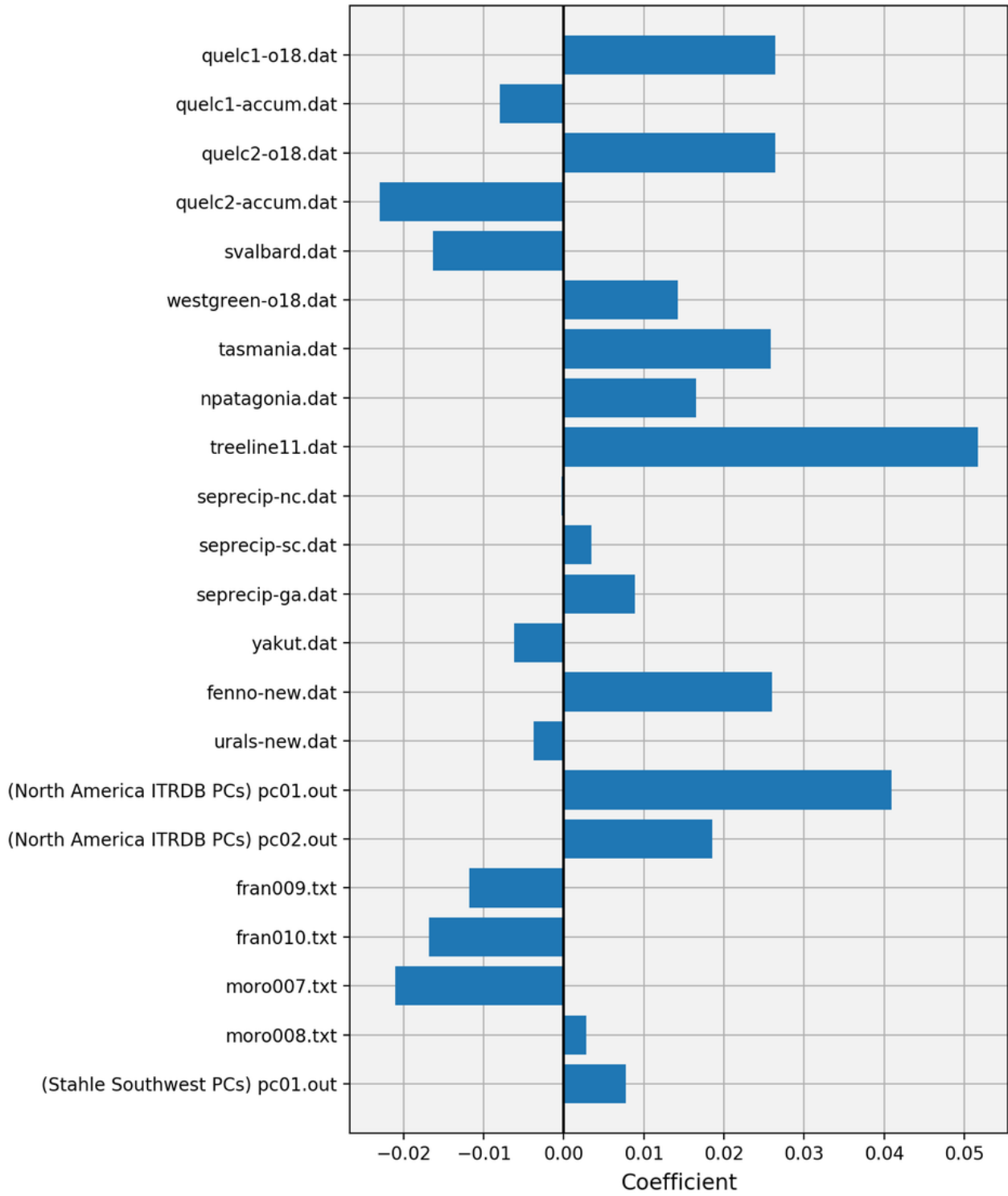
MBH98 regression coefficients
AD 1400–1449 interval
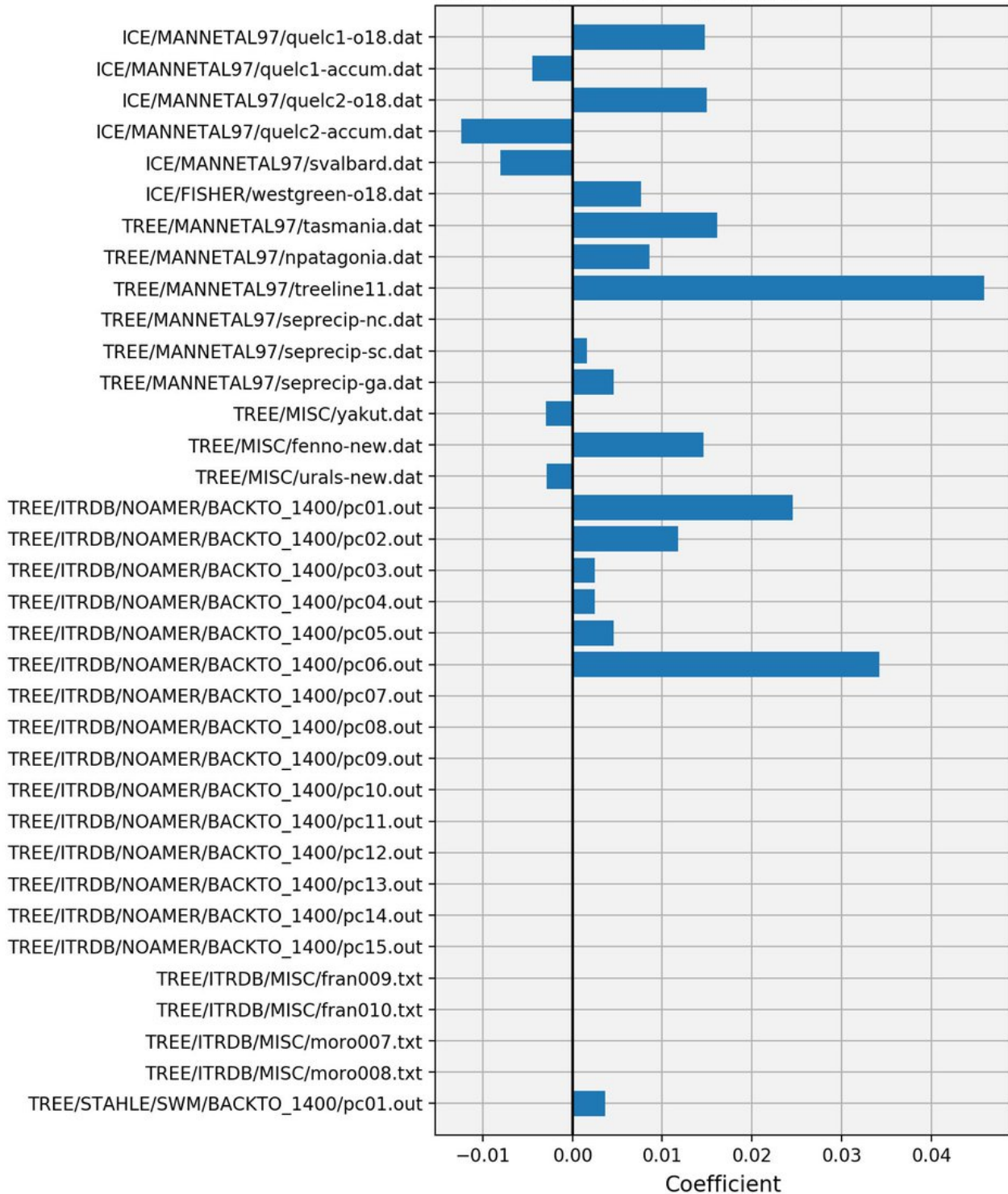
(11/17) Here is a side-by-side comparison of the MBH98 and WA regression coefficients.

AD 1400–1449 regression coefficients
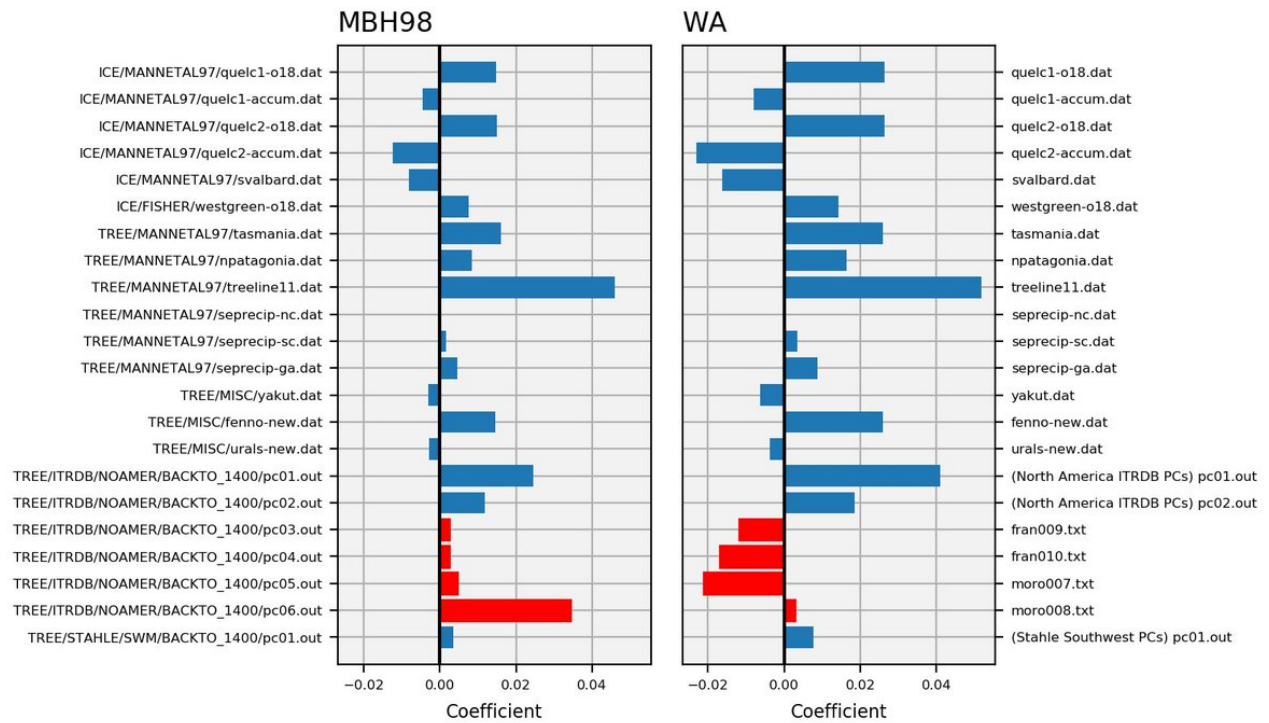
(12/17) MBH98 and WA also standardized the proxy data differently (detrended versus nondetrended standard deviations), so their regression coefficients aren't directly comparable. For completeness, here are comparisons for each standardization.

AD 1400–1449 regression coefficients (MBH98 standardization)

AD 1400–1449 regression coefficients (WA standardization)

(13/17) The difference between WA and MBH98 disappears almost completely if the WA proxy data is replaced with the correct Climategate proxy data and the WA code is modified to standardize by detrended standard deviations.

```
YmatA<-scan(file.proxy)
YmatA<-t(matrix(YmatA,nrow=obj$PyA,ncol=Ny))
ctrsY<-apply(YmatA[match(controldata$years.calibration, obj$YyearsA),],2,mean)
#  stdsY<-sqrt(apply(YmatA[match(controldata$years.calibration, obj$YyearsA),],2,var))
stdsY<-sqrt(apply(detrend(YmatA[match(controldata$years.calibration, obj$YyearsA),]),2,var))

obj$Ymat.anomaly<-t((t(YmatA)-ctrsY)/stdsY)
```
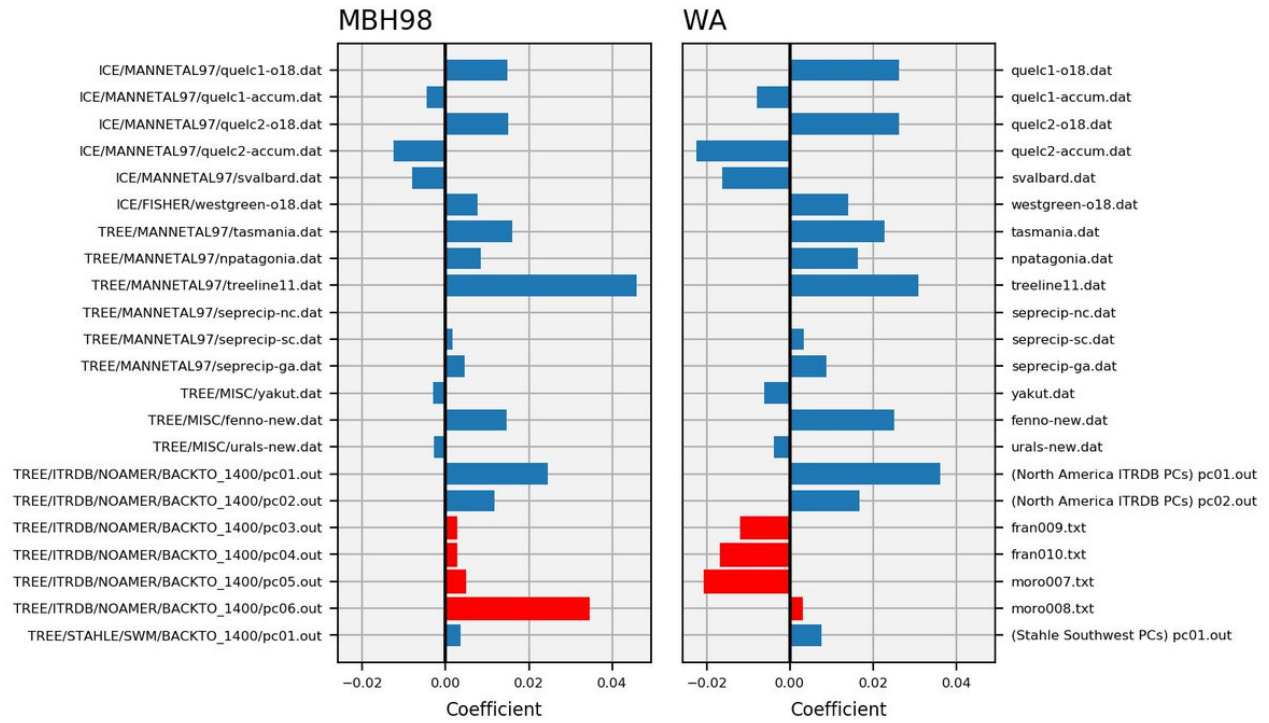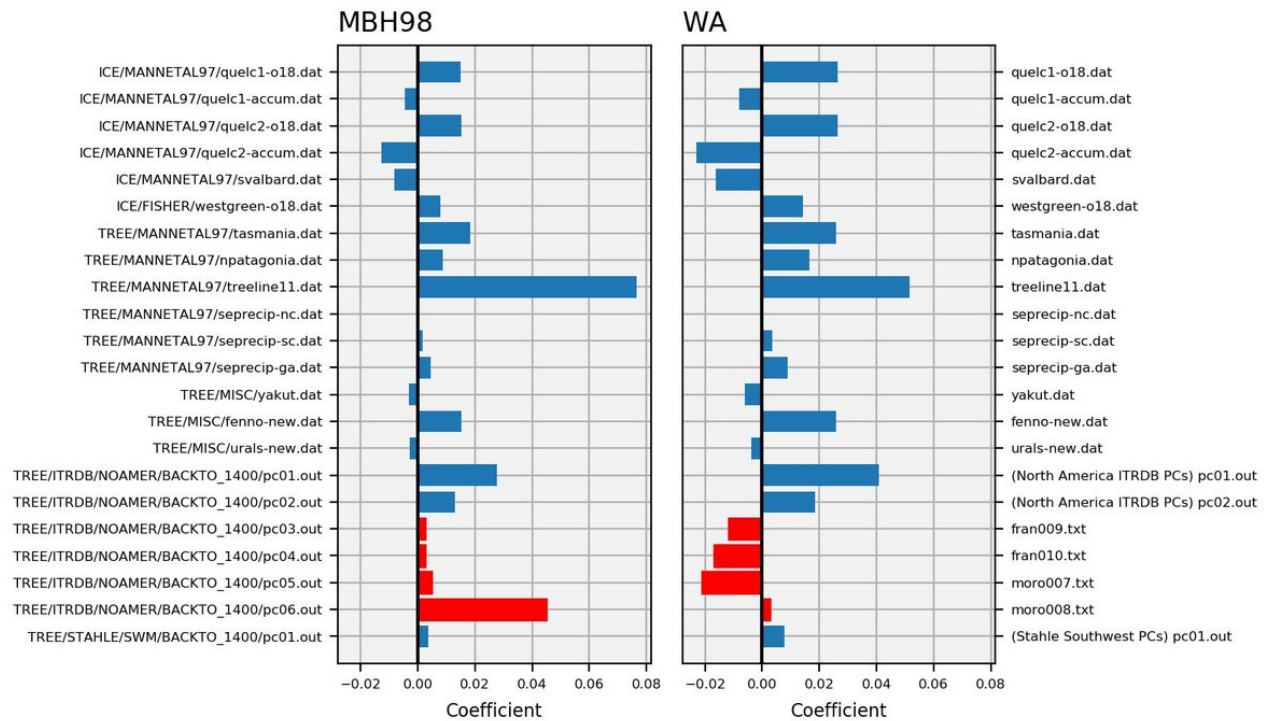

WA with Climategate data and MBH98 standardization
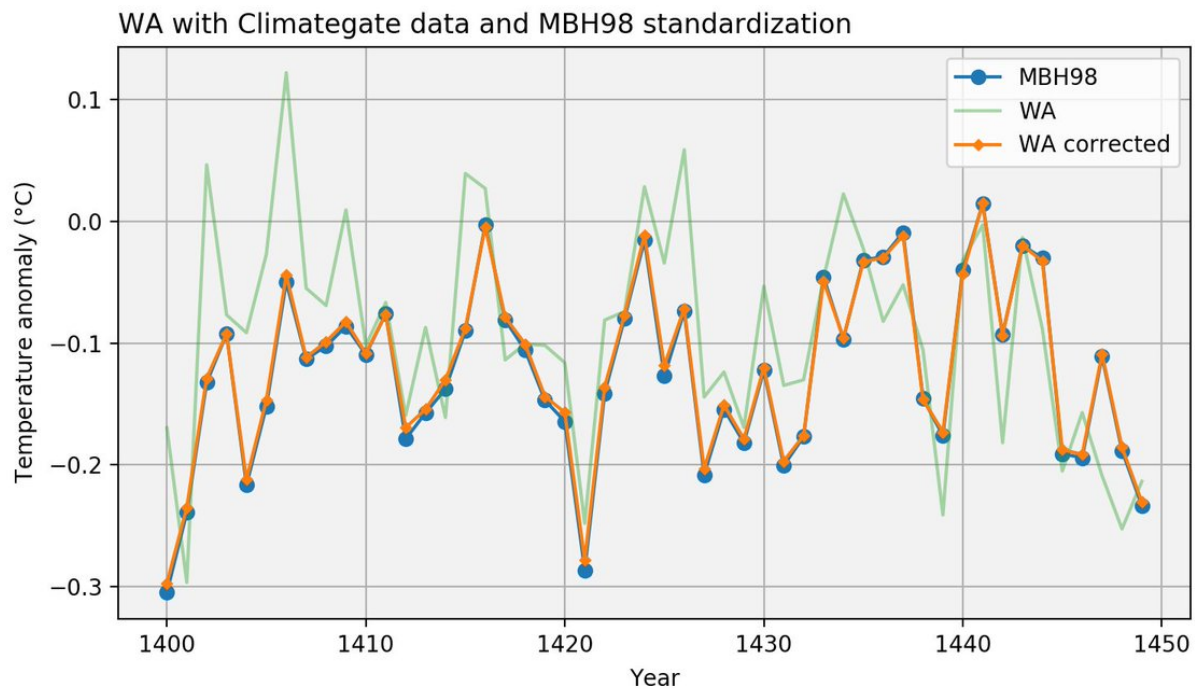
(14/17) WA begin their results section with guesses. Nowhere do they state the real reasons for the discrepancy in 1400–1449: the swapping of four North American PCs (including the heavily weighted sixth PC) for French and Moroccan data, and the different standardizations.

3 Results

3.1 MBH original reconstruction

Our emulation of the MBH98 results is shown in Figure 1. The Northern Hemisphere mean surface temperature reconstruction (WA) is nearly identical to the original MBH98 reconstruction (Fig. 1, red and grey lines). The slight differences are related to our methodological simplifications of using a consistent annual time step throughout the reconstruction process and equal weighting of the proxies. Validation statistics for the WA reconstruction in relation to the original MBH98 results are reported in Table 1, comparable statistics for the various MM-examination scenarios (1–6) are reported in Table 2. Beyond their calibra-

(15/17) By "equal weighting of the proxies" they mean that they didn't use the weights included in the proxy lists. MBH98 didn't either, so it doesn't explain any difference whatsoever.

Not the greatest start to a results section.

```
datalist1400.dat ✕

WGT        proxy
0.5        quelc1-o18.dat
0.5        quelc1-accum.dat
0.5        quelc2-o18.dat
0.5        quelc2-accum.dat
1          svalbard.dat
0.5        westgreen-o18.dat
1          tasmania.dat
0.75       npatagonia.dat
0.5        treeline11.dat
0.33       seprecip-nc.dat
0.33       seprecip-sc.dat
0.33       seprecip-ga.dat
1.5        yakut.dat
1          fenno-new.dat
1          urals-new.dat
           North America ITRDB PCs
1          pc01.out
1          pc02.out
           End PCs
0.33       fran009.txt
0.33       fran010.txt
0.5        moro007.txt
0.5        moro008.txt
           Stahle Southwest PCs
1          pc01.out
```

(16/17) Wikipedia also gets the PCA stuff wrong in their hockey stick article, which cites Wahl and Ammann's flawed analysis.

en.wikipedia.org/wiki/Hockey_st…

(17/17) In conclusion, Wahl and Ammann did use the wrong dataset, and presented

made-up results to boot.

End.

Source: https://twitter.com/detgodehab/status/1636839993304907783
Thread: https://twitter-thread.com/t/1636839993304907783