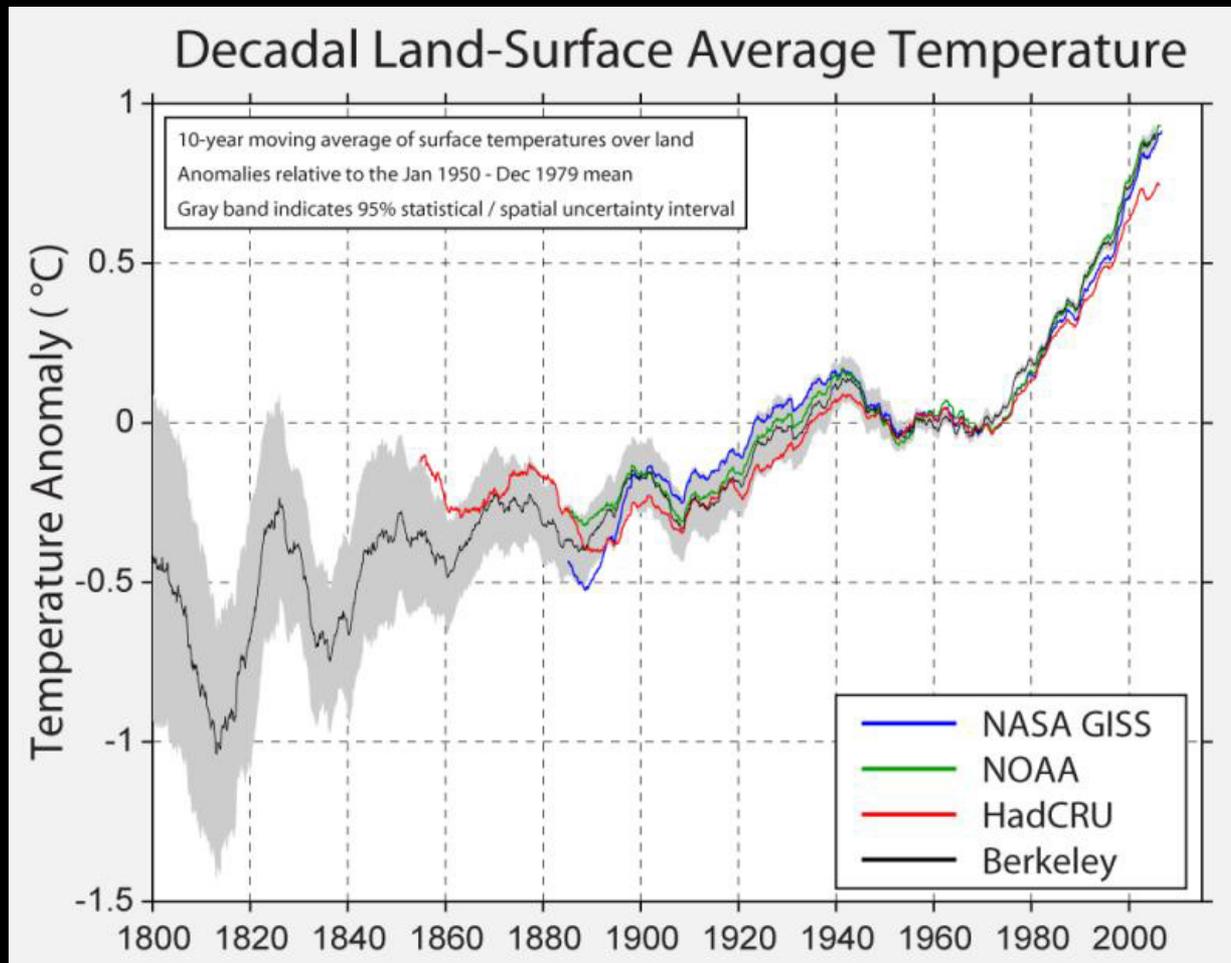


Berkeley Earth Surface Temperature Project



Richard Muller
Robert Rohde
Judith Curry
Donald Groom
Bob Jacobsen
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Arthur Rosenfeld
Charlotte Wickham
Jonathan Wurtele

Elizabeth Muller

Novim, U. Calif. Berkeley,
Lawrence Berkeley Lab,
Georgia Tech, Oregon
State

preprints and merged data now online at www.BerkeleyEarth.org



Wall St. Journal Op-Ed

The Case Against Global-Warming Skepticism

There were good reasons for doubt, until now.

Are you a global warming skeptic? There are plenty of good reasons why you might be....

As submitted:

Cooling the Warming Debate

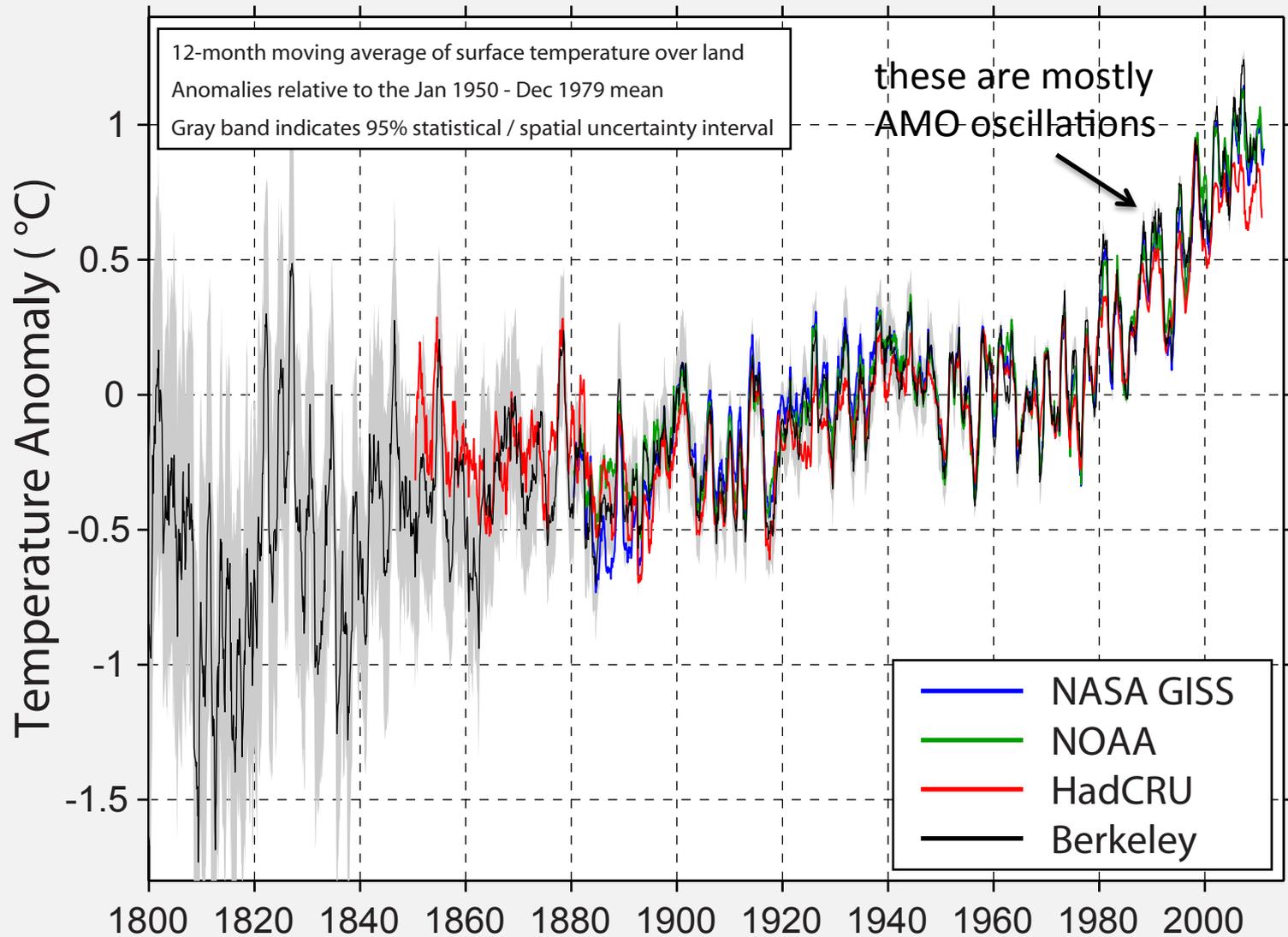
Are you a global warming skeptic? There are plenty of good reasons why you might be....

I strongly dislike the title they used. I was not notified or warned.

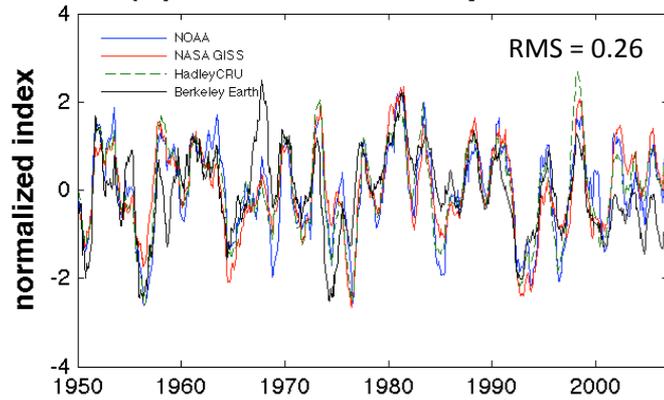
backwards presentation

- results first (motivation)
- data selection bias, homogenization bias, station quality, urban heat island
- Berkeley Earth The Movie
- Robert Rohde: data merging, temperature reconstruction, spatial and statistical uncertainties

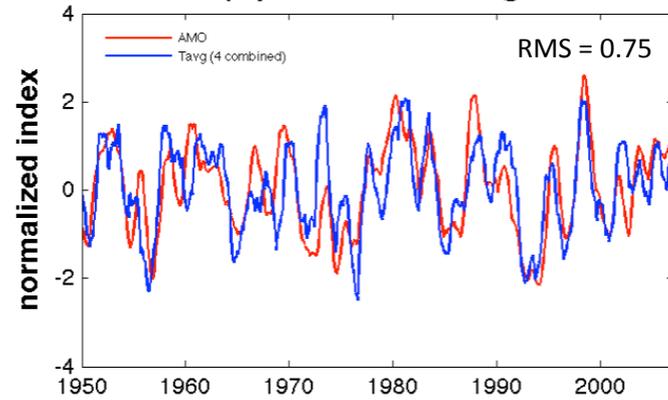
Annual Land-Surface Average Temperature



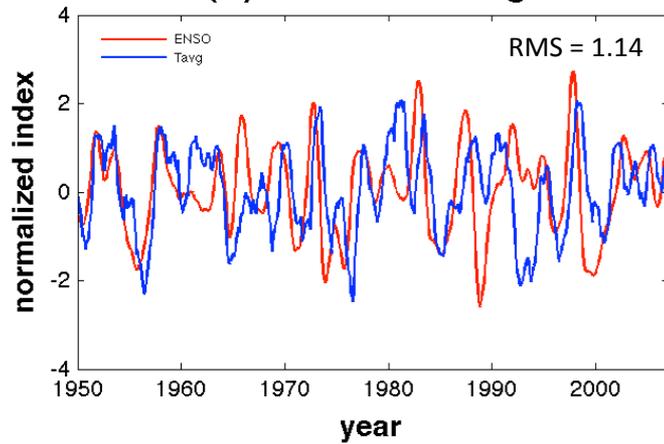
(A) Global Land Temperature



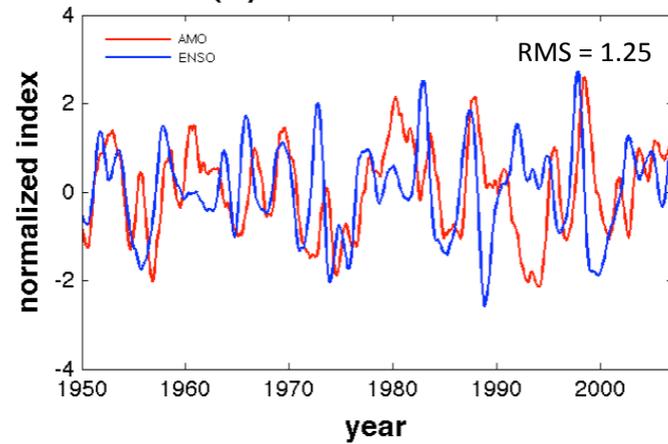
(B) AMO and Tavg



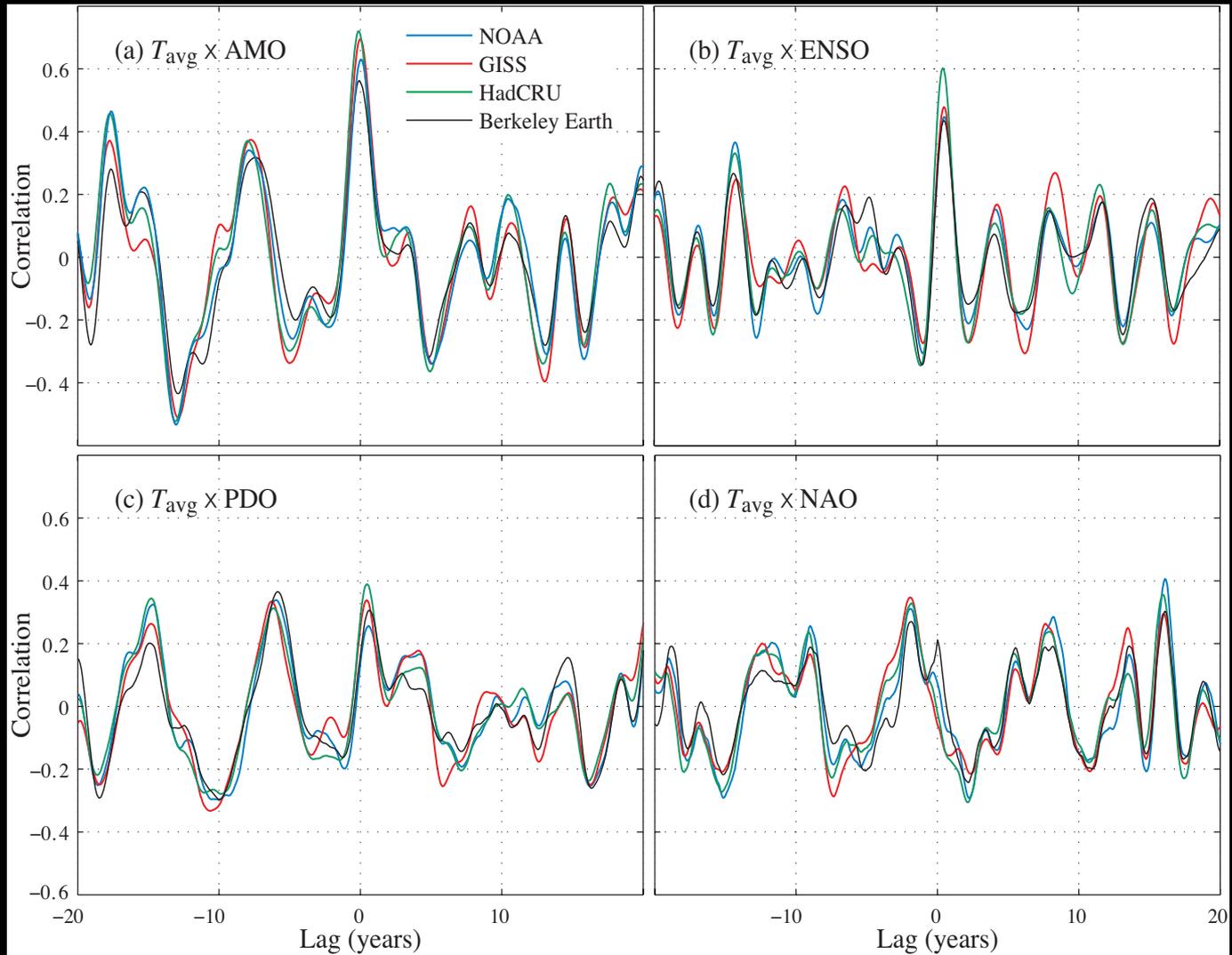
(C) ENSO and Tavg



(D) AMO and ENSO



cross-correlations

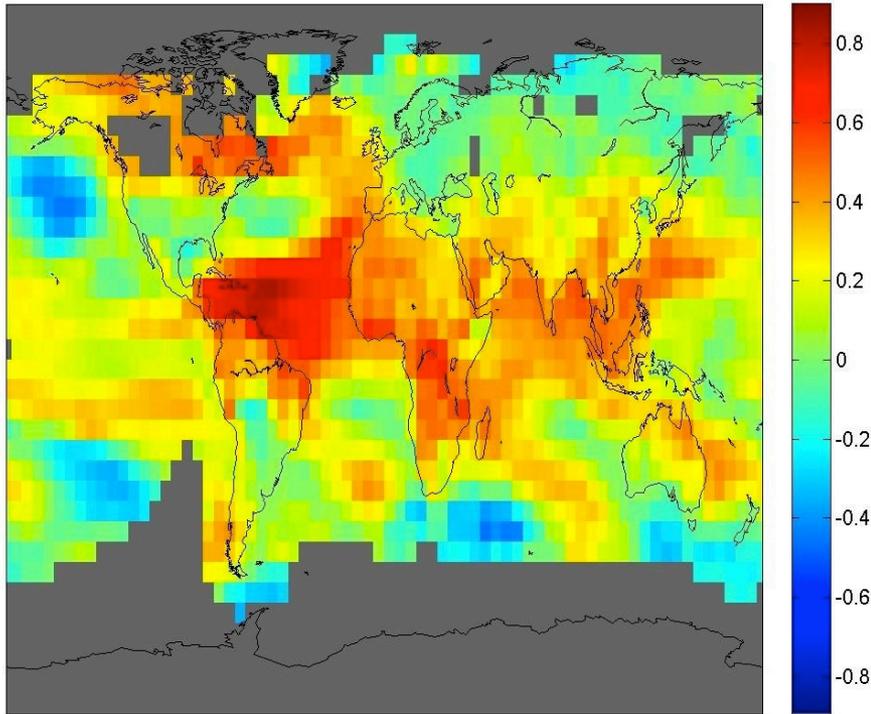


correlation map

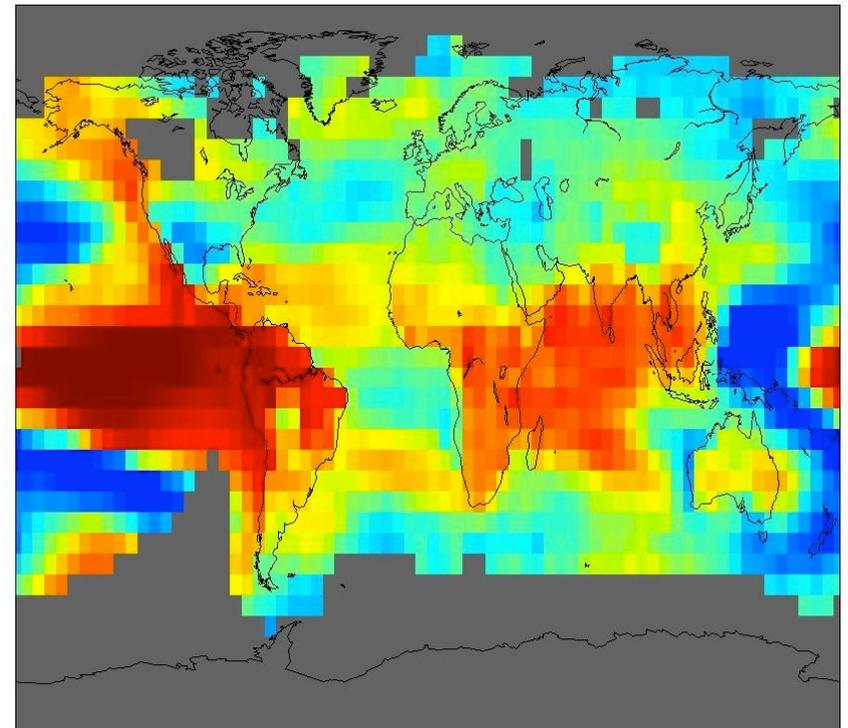
AMO

ENSO

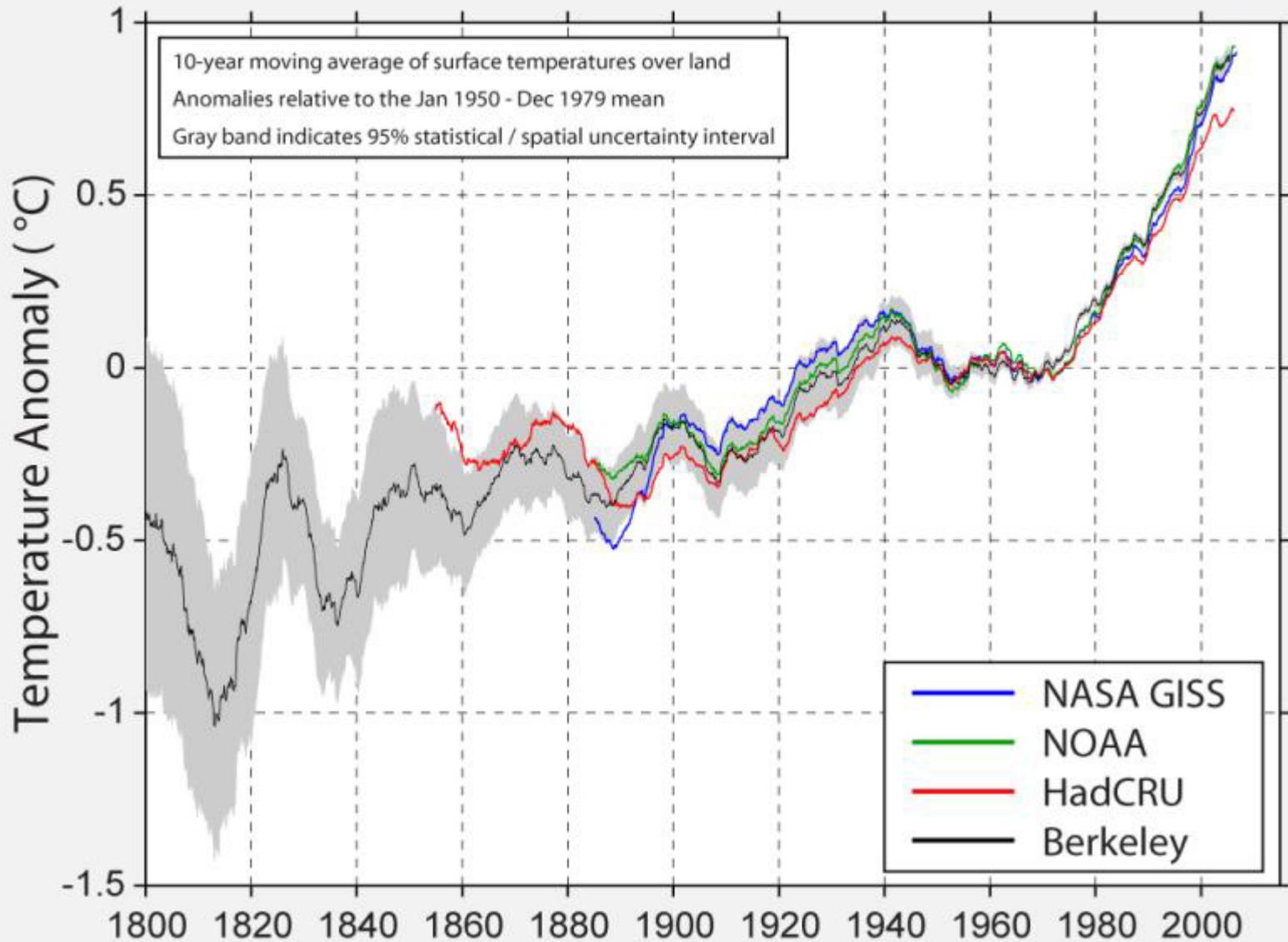
AMO vs. NOAA temperatures, short-term correlation, 1950-2010



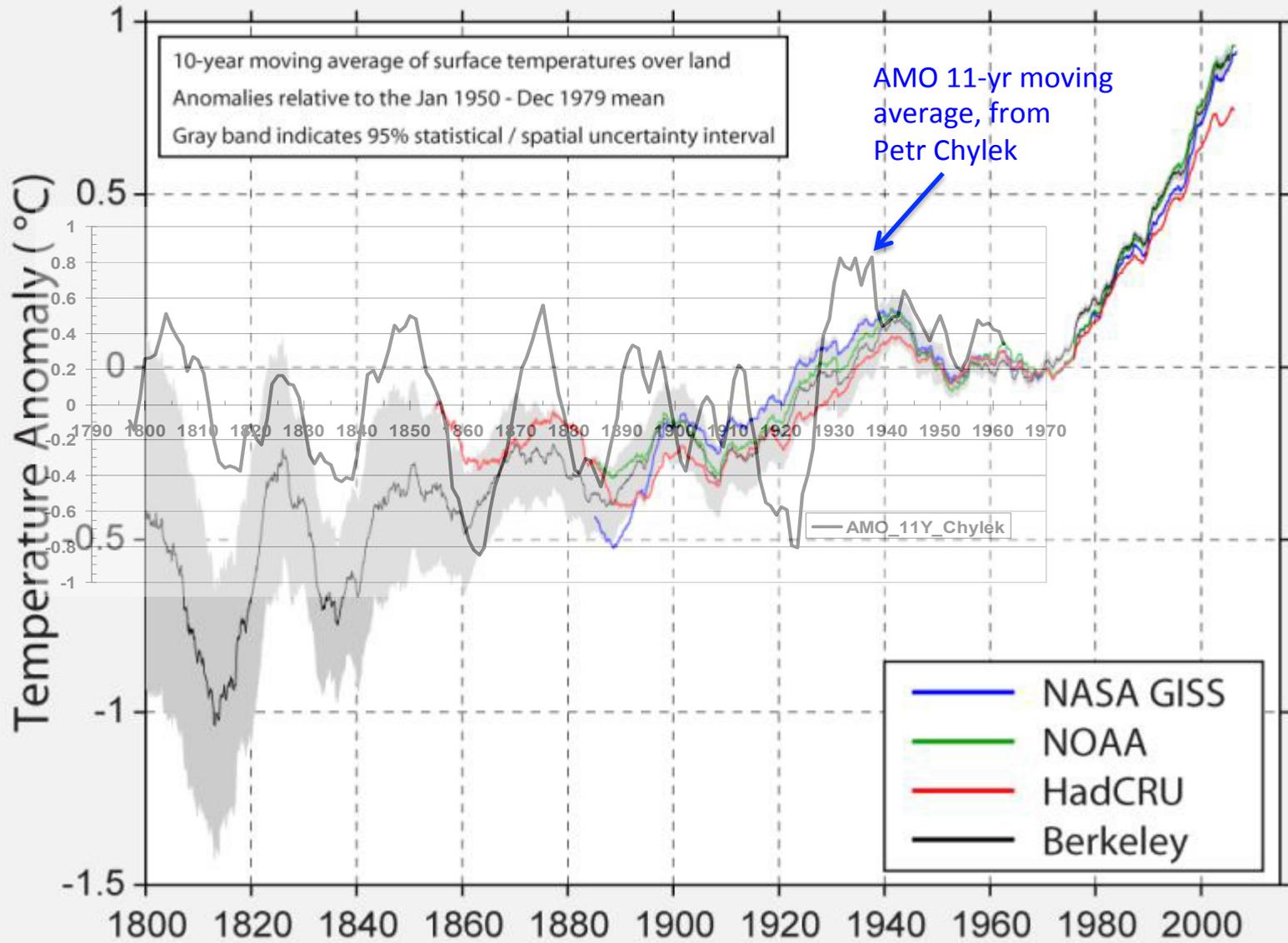
ENSO vs. NOAA temperatures, short-term correlation, 1950-2010



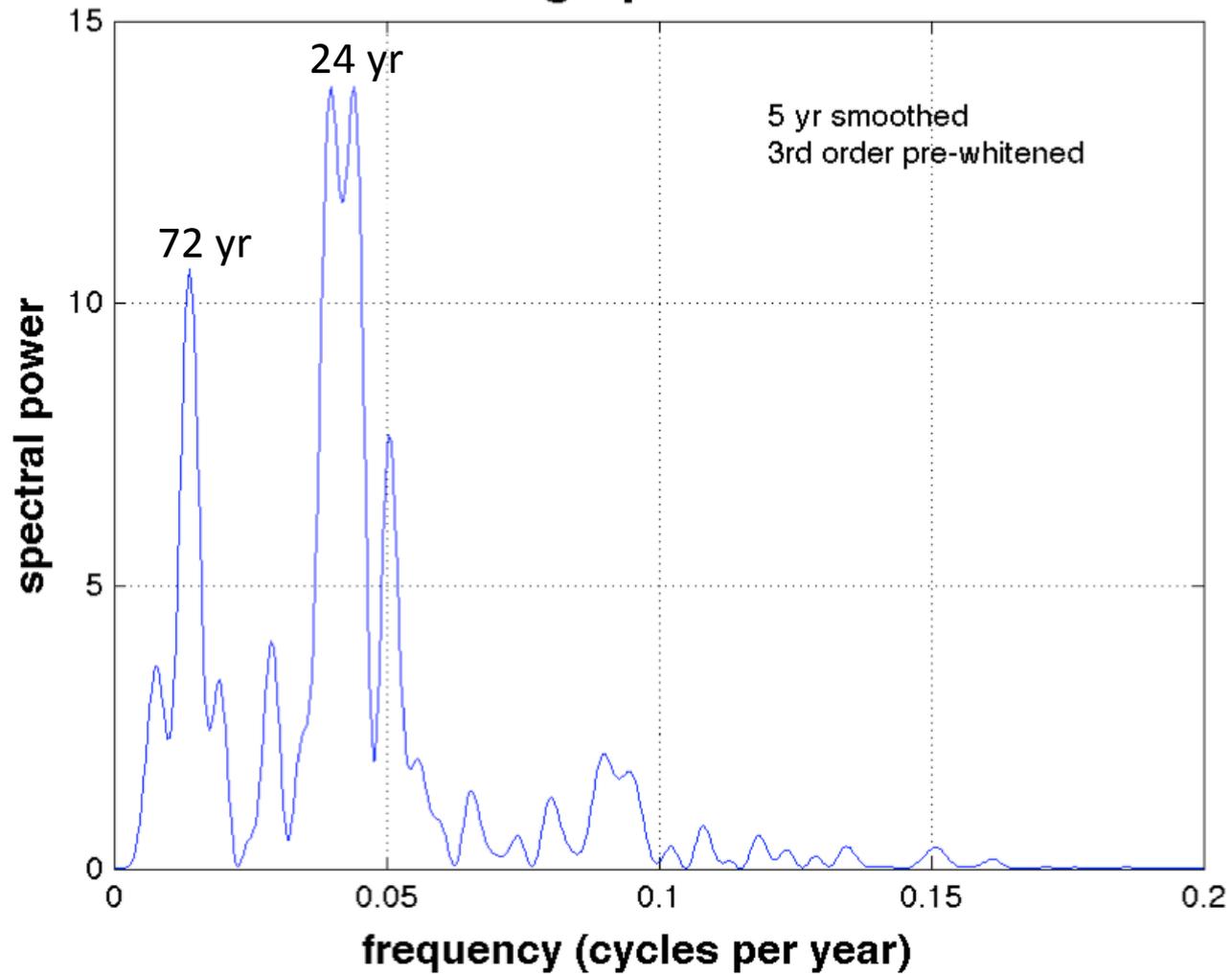
Decadal Land-Surface Average Temperature



Decadal Land-Surface Average Temperature



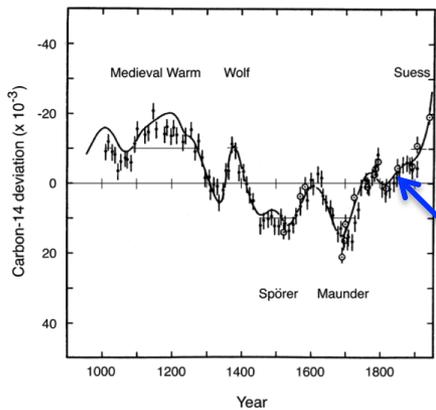
Tavg Spectrum



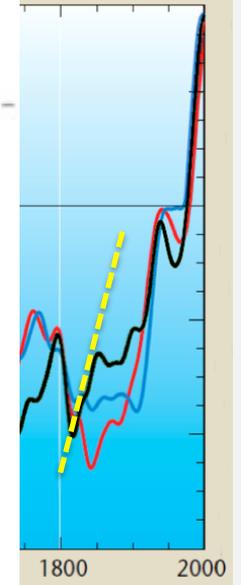
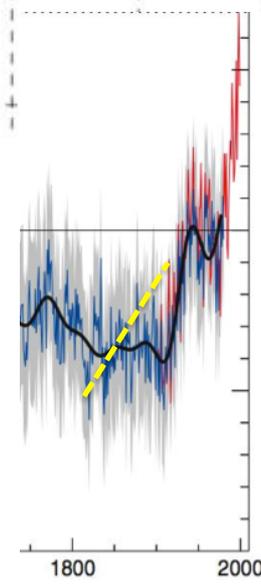
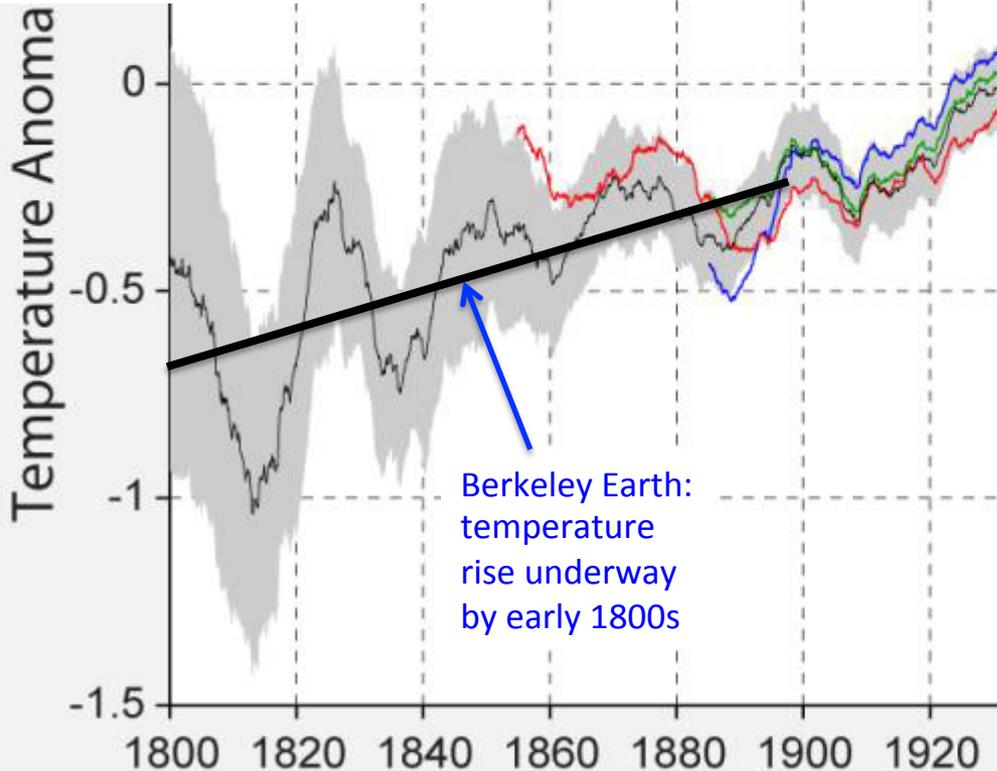
note: 24 is 3rd harmonic of 72

also note: 72 is 3rd subharmonic of 24

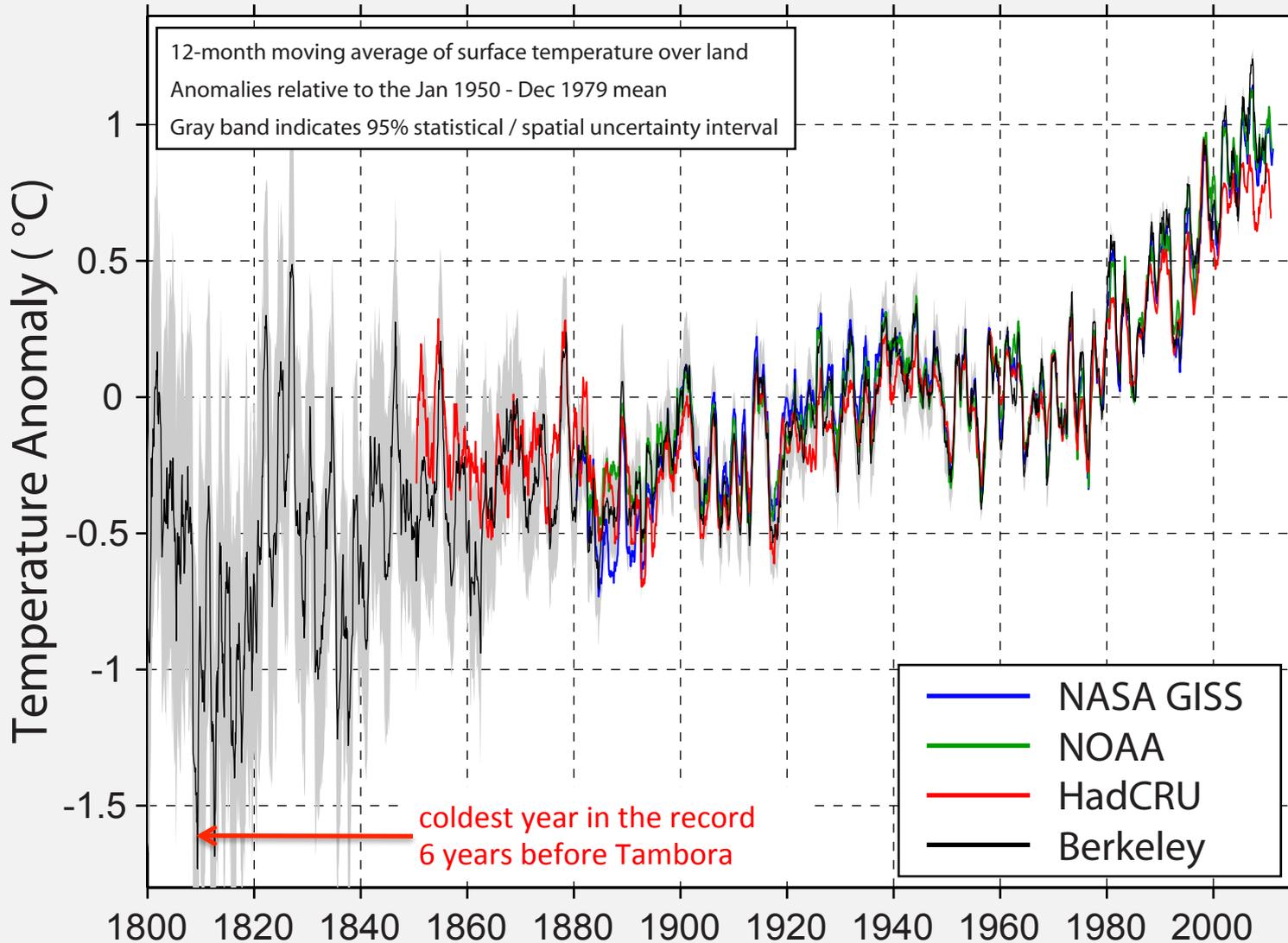
Land-Surface Average Temperature



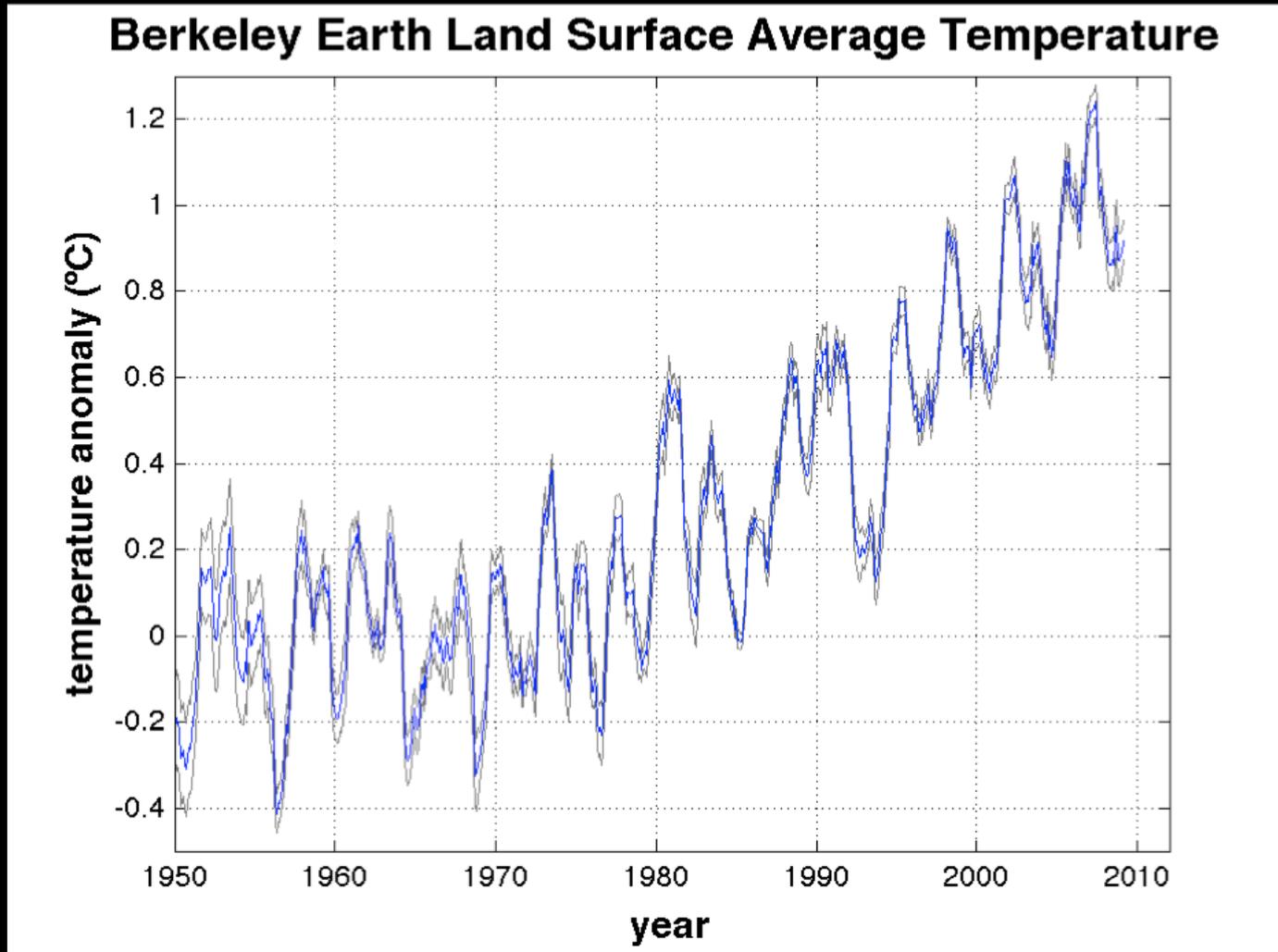
IPCC 1995
temperature
rise underway
by late 1700s



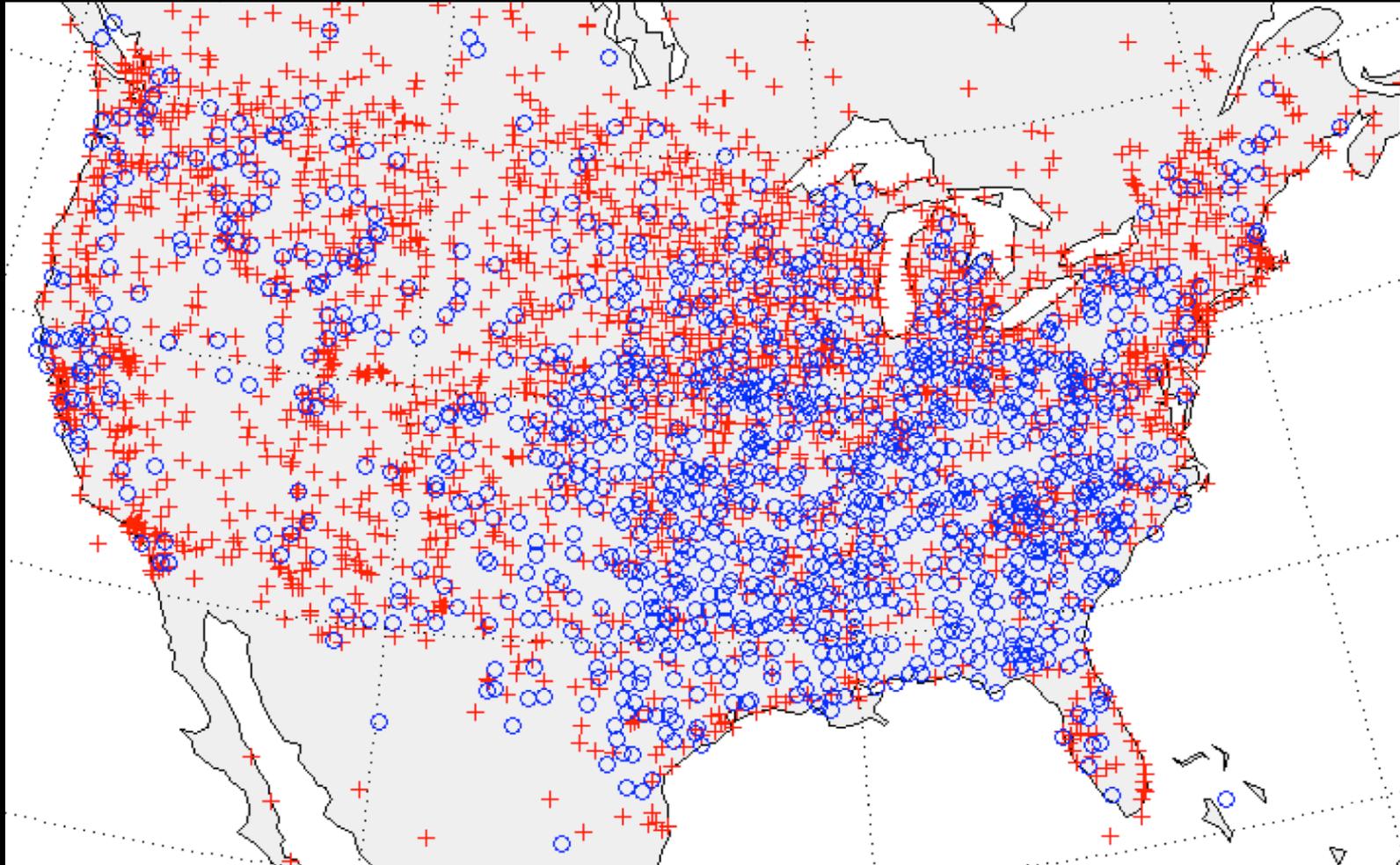
Annual Land-Surface Average Temperature



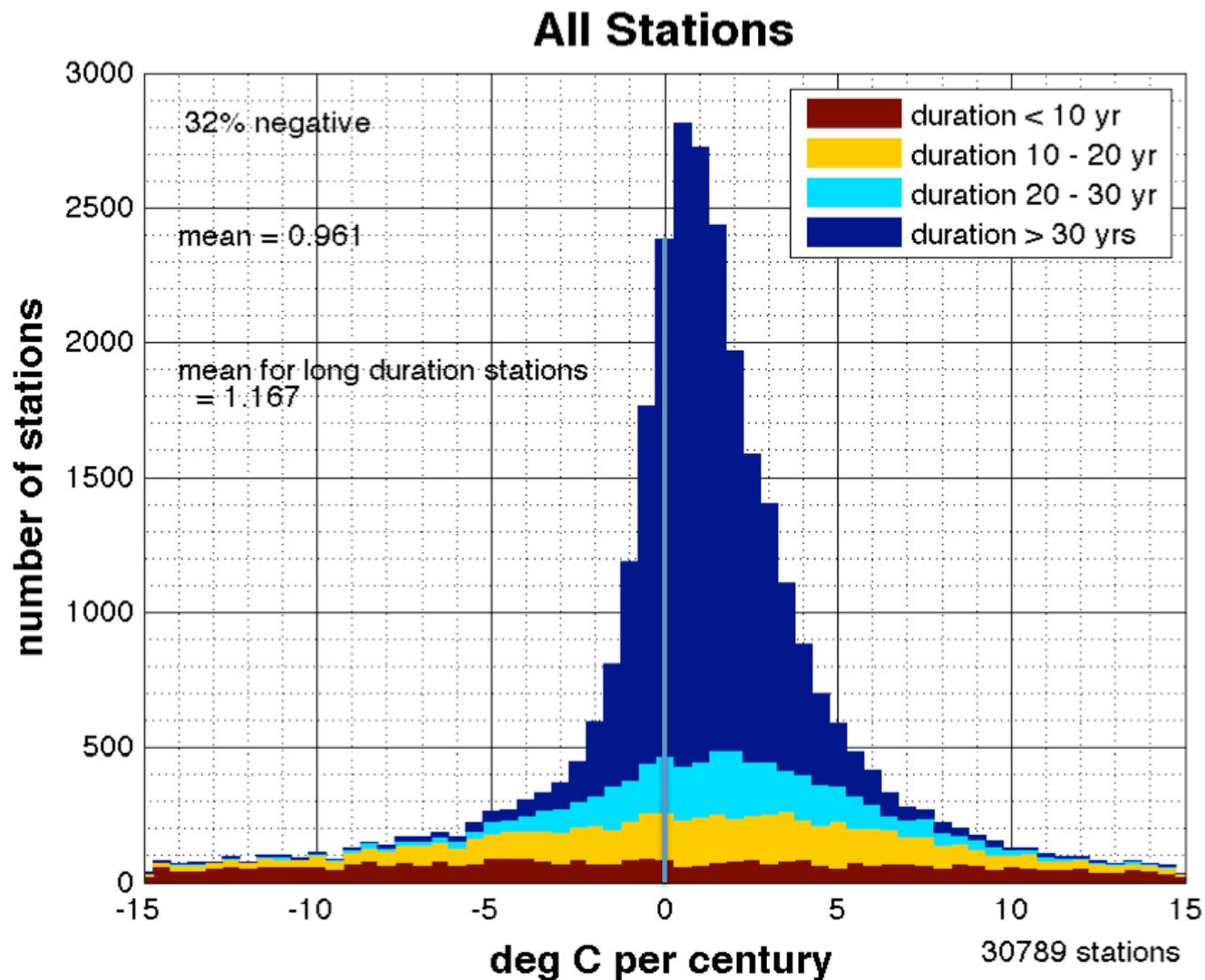
Has global warming stopped?



100-year cooling & warming sites

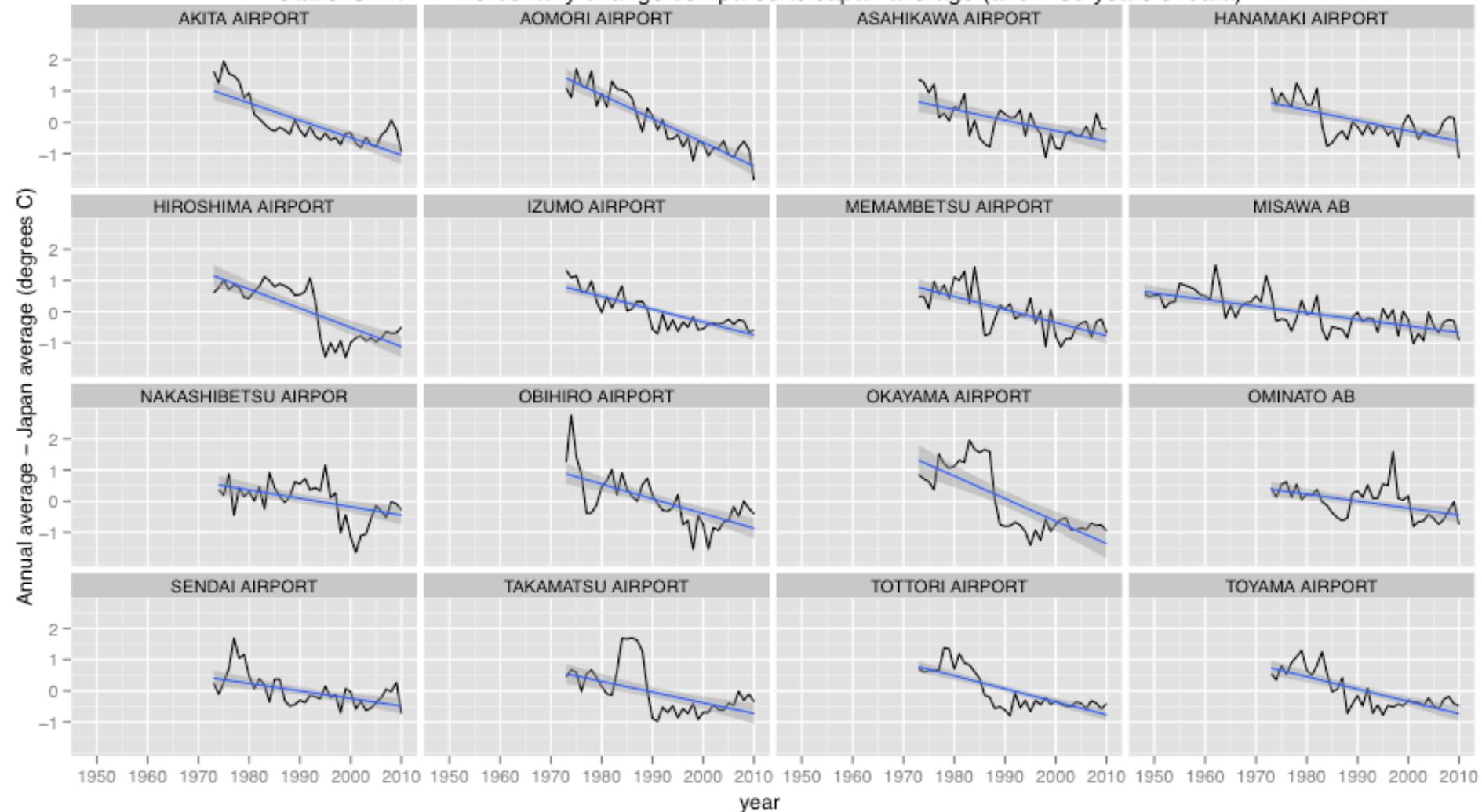


station temperature changes

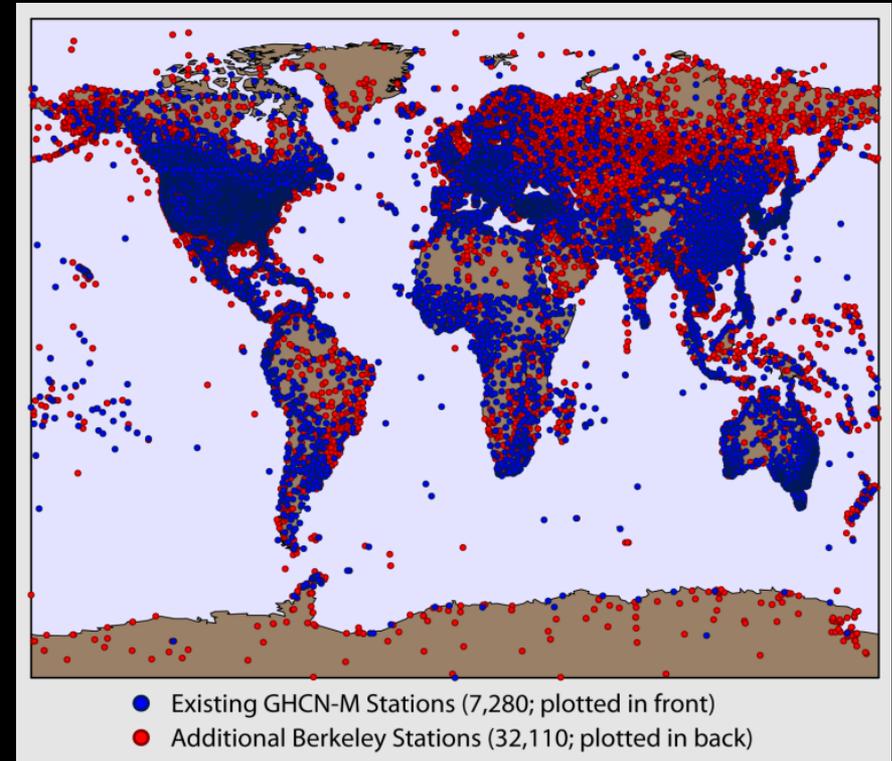
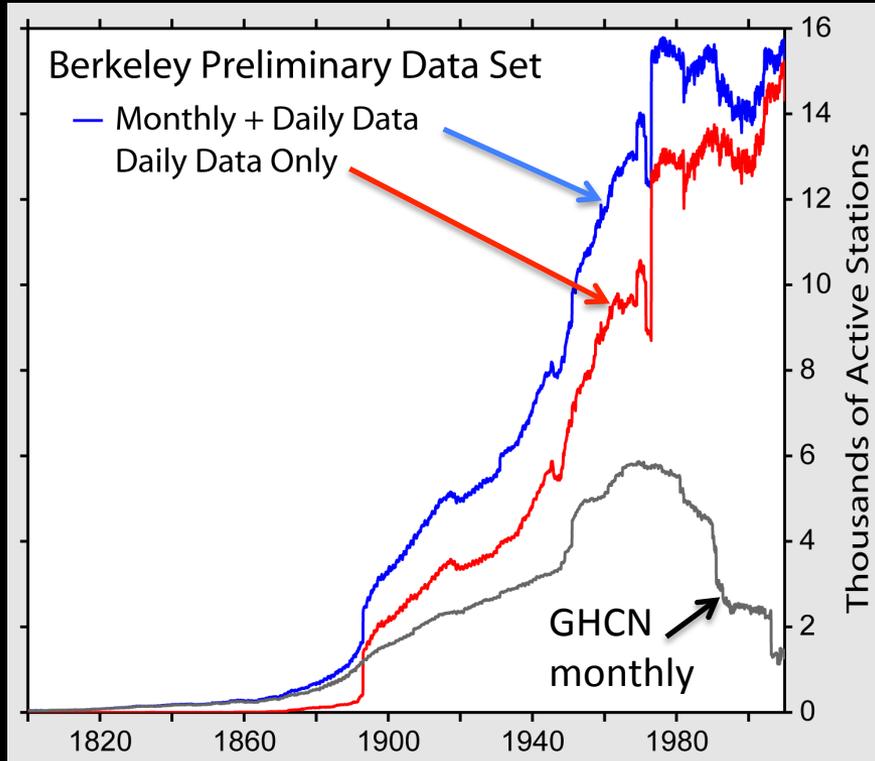


Japanese Airports “cooling”

Stations with $< -2\text{C}/\text{century}$ change compared to Japan average (and > 30 years of data)



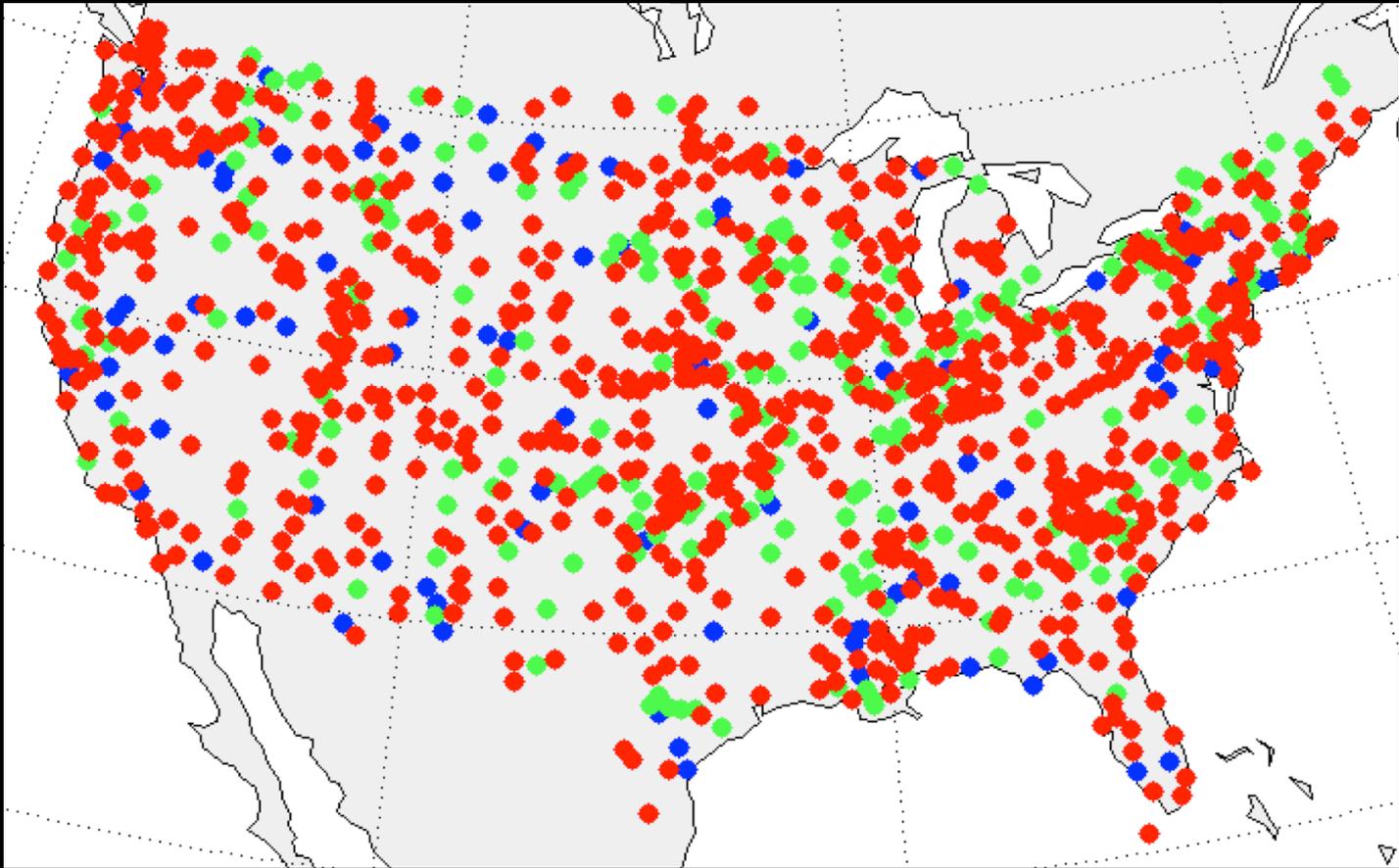
Station selection bias



37,633 out of 39,028 stations used (96%)
most of the unused were < 6 months
c.f. GHCN-M: 7,280 stations (19%)

Merged data now online at www.BerkeleyEarth.org

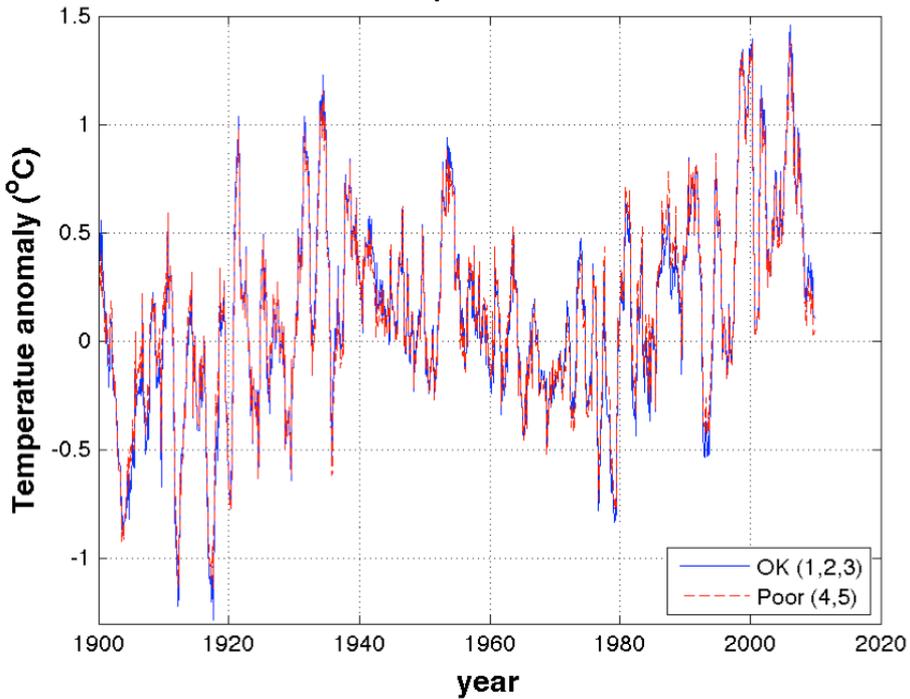
Station Quality



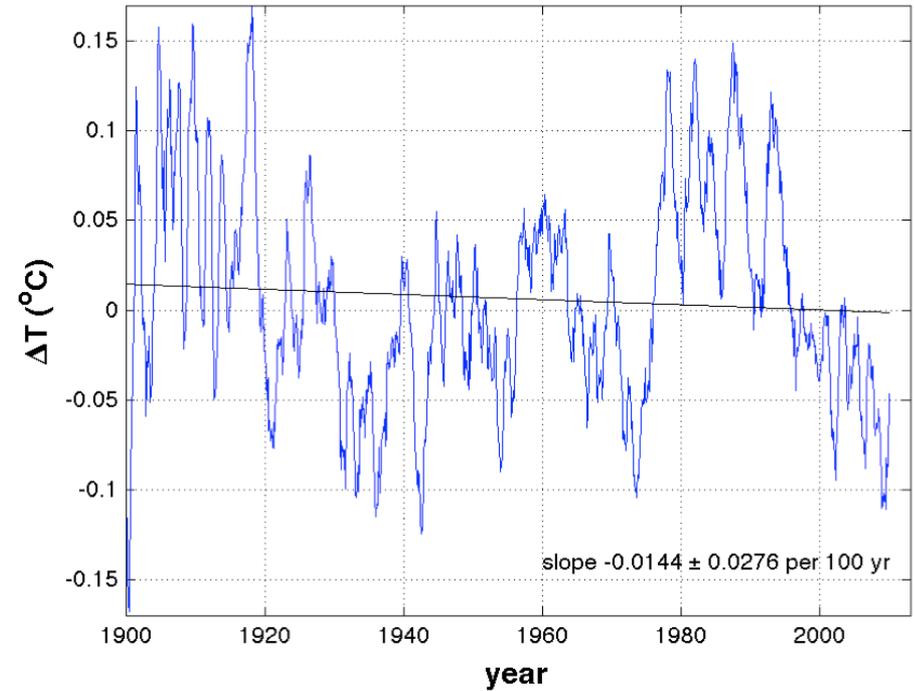
- ranks 1 & 2 ($< 1^{\circ}\text{C}$)
- rank 3 (1°C)
- ranks 4 & 5 ($> 2^{\circ} - 5^{\circ}\text{C}$)

US reconstructed temperature by quality (1,2,3) and (4,5)

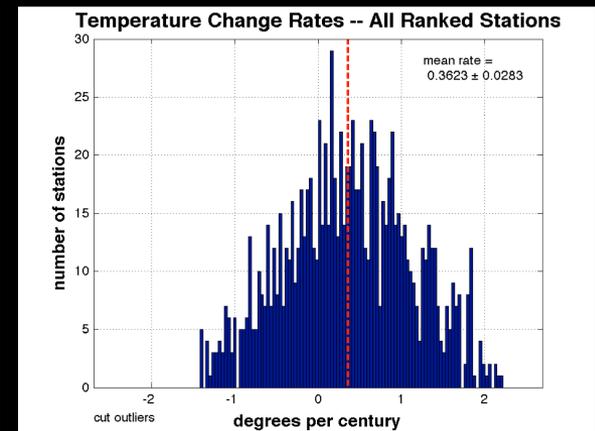
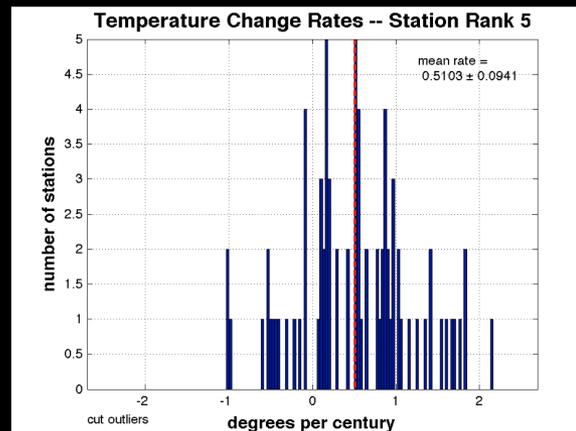
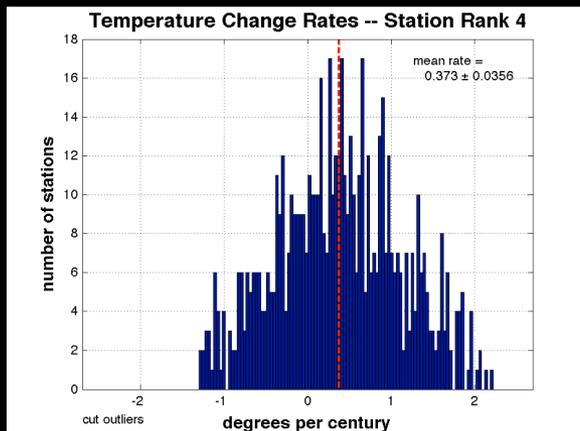
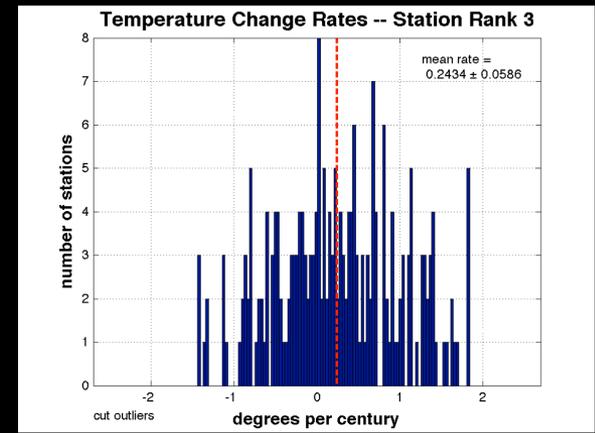
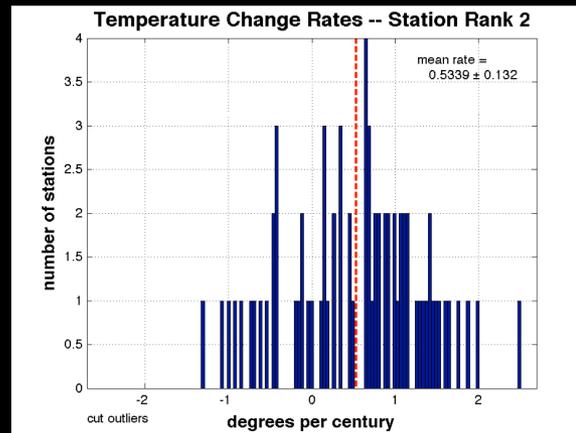
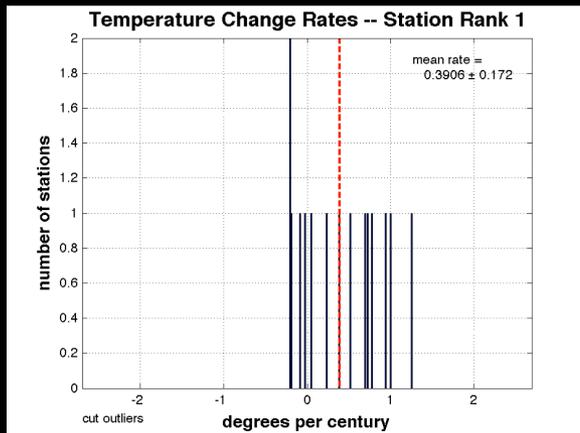
both plotted



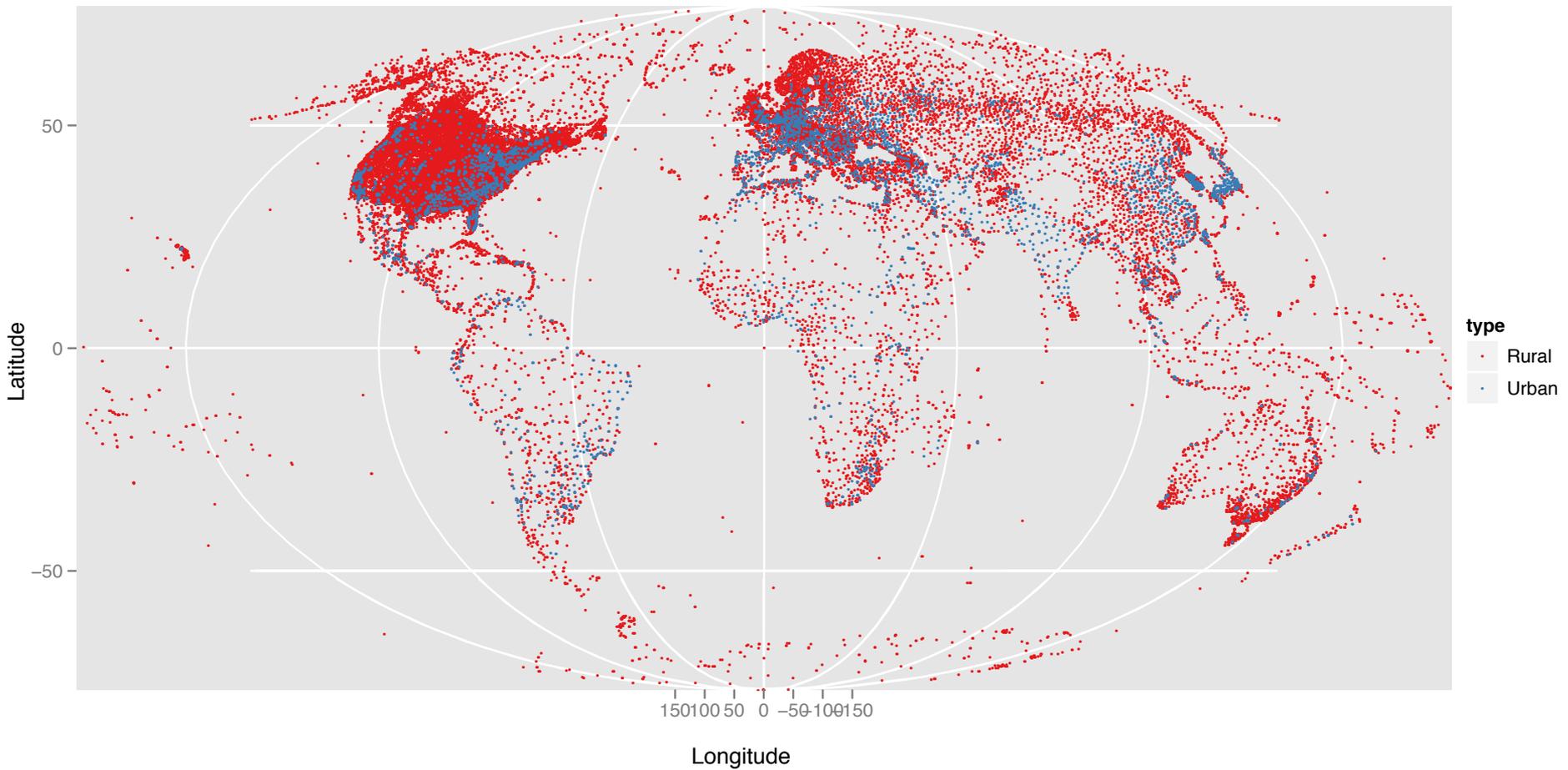
difference



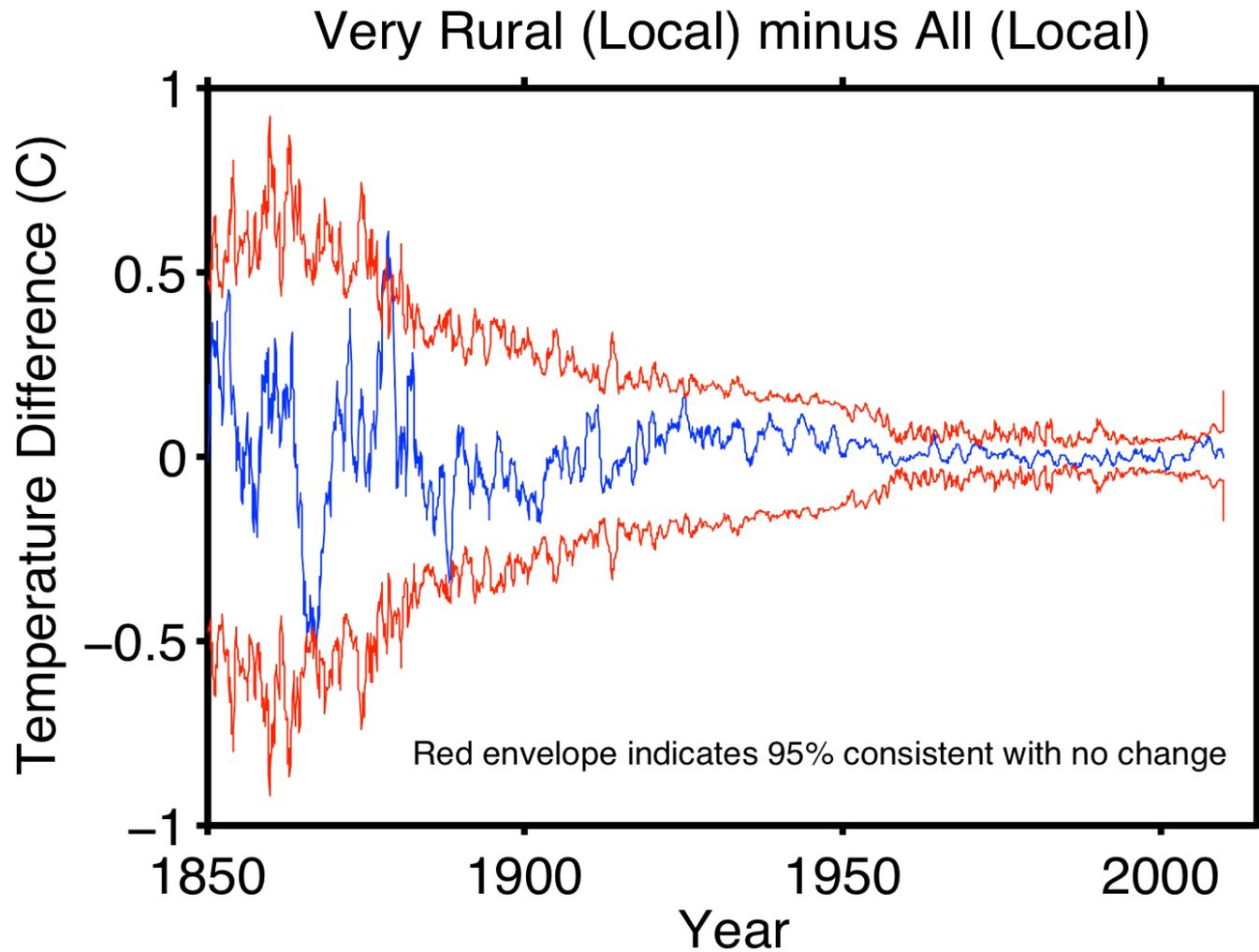
Temperature change rates by quality



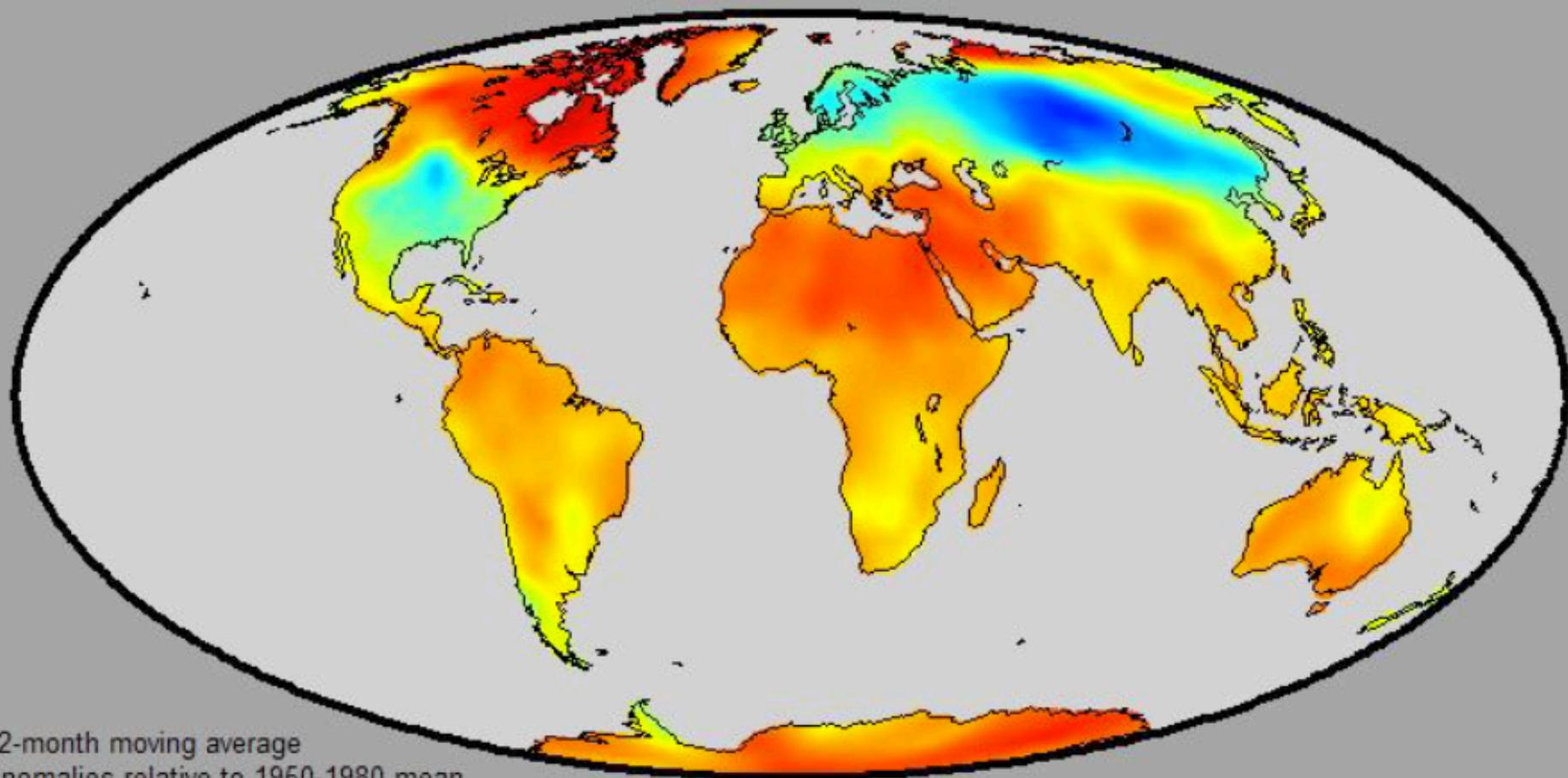
Urban and Rural sites classified using MODIS satellite map



Urban Heat Island Influence



Berkeley Earth: *The Movie*



to watch it go to: <http://www.berkeleyearth.org/movies.php>



BERKELEY
EARTH
SURFACE
TEMPERATURE

4 preprints and merged data now online at:
www.BerkeleyEarth.org