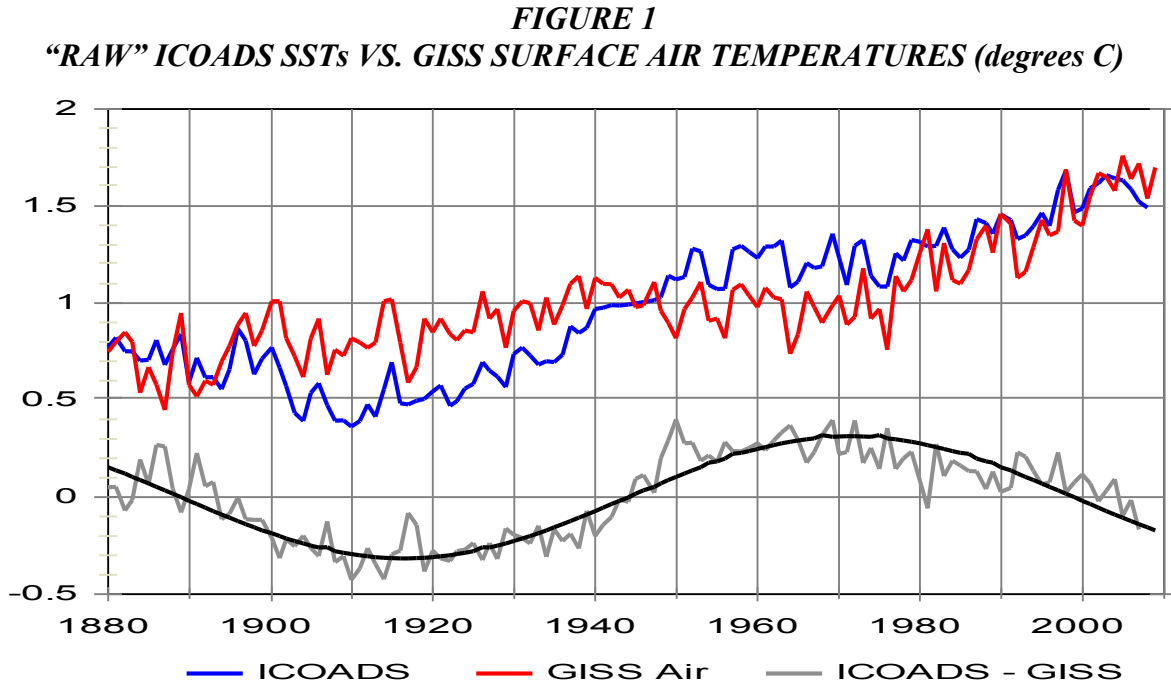


THE SOLAR-SST RELATIONSHIP – THE PLOT THICKENS

In the previous thread on this topic I referred to a graph that showed a cyclic relationship between SSTs and surface air temperatures, but it was buried deep in an attachment, and only a few people (notably David) seem to have seen it. Nevertheless, it shows some very interesting features, so here it is again:



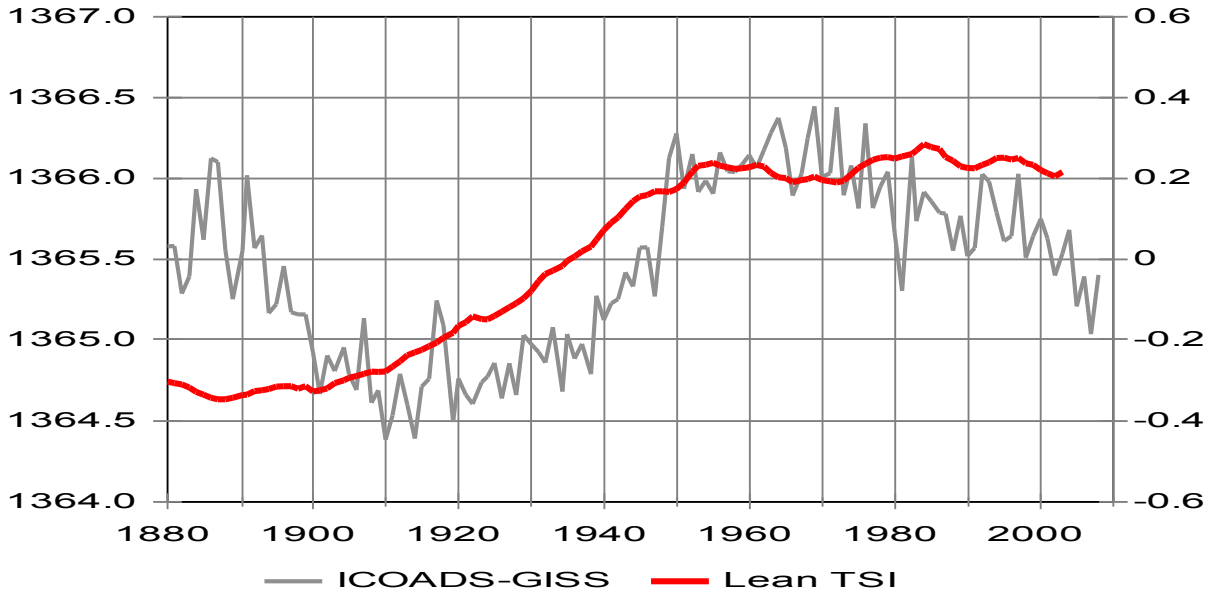
SSTs and air temperatures record about the same amount of overall warming since 1880, but the ICOADS-GISS difference plot shows them oscillating around each other over the intervening period, with the sea surface warming relative to the air for about 50 years and then cooling relative to the air over the next fifty. The oscillations are regular enough to be fitted closely ($R=0.89$ for unsmoothed ICOADS-GISS, $R=0.96$ for smoothed) using a sine curve with a period of 110 years and an amplitude of 0.63C.

Is this periodicity real or is it just an artifact of the data? If it's an artifact of the data it's a very curious one. Biases and random errors could of course give a result like this, but it would require a rather unlikely combination of the two to do it.

So let's assume the periodicity is real. What might cause it? The prime suspect is again the sun, and a recent paper by Komitov et al. (<http://arxiv.org/ftp/arxiv/papers/1011/1011.0347.pdf>) conveniently identifies a 110-120 year cycle in the solar record over the last few hundred years. Might this cycle correlate with the 110-year cycle in the SST-air temperature data?

To check this I first compared the SST-air temperature difference against smoothed Lean TSI. I got the results shown in Figure 2. They weren't all that encouraging.

FIGURE 2
ICOADS SST MINUS GISS AIR VS. LEAN TSI
Left Scale Lean TSI watts/sq m. Right scale ICOADS-GISS degrees C



Then it occurred to me that this wasn't a fair comparison because ICOADS-minus-GISS is effectively detrended while Lean TSI isn't. So I detrended Lean TSI between 1810 – the Dalton minimum – and 2000, shifted it to simulate a 12-year lag in temperature response, replotted the comparison, and got the results shown in Figure 3:

FIGURE 3
ICOADS SST MINUS GISS AIR VS. DETRENDED LEAN TSI
Left Scale Lean TSI watts/sq m. Right scale ICOADS-GISS degrees C

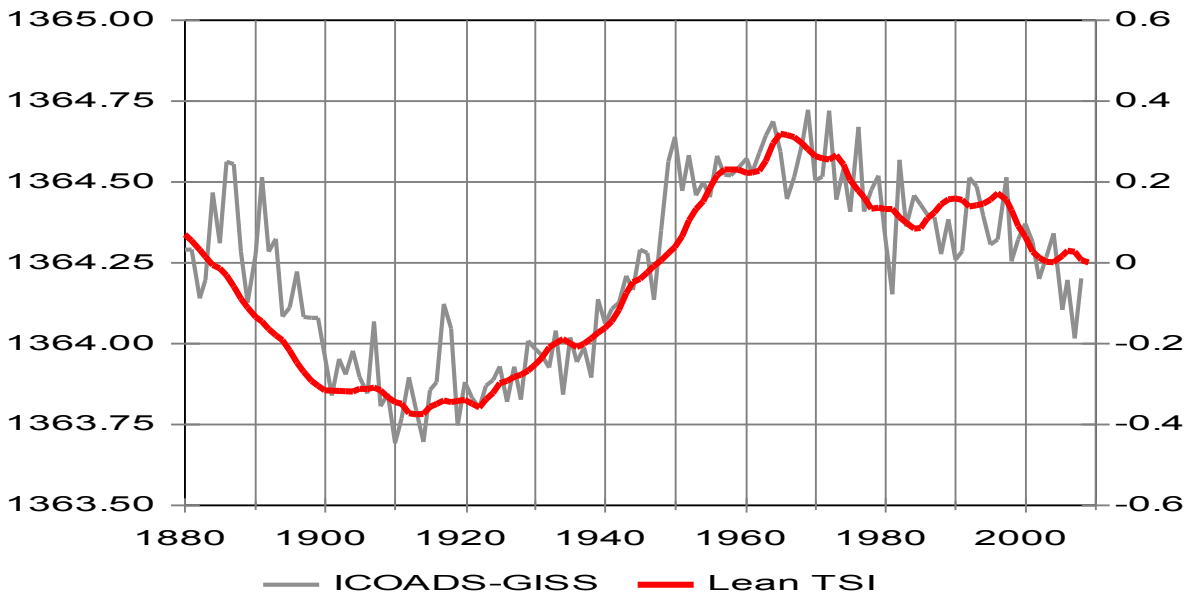


Figure 3 also gives $R=0.89$ for unsmoothed and $R=0.96$ for smoothed ICOADS-GISS, and Lean TSI gives $R=0.94$ relative to the Figure 1 sine curve. Repeating the comparison using sunspot counts, the AA geomagnetic index and Svalgaard TSI gives substantially the same results.

So now we have a new wrinkle. Not only do solar cycles influence absolute temperatures, they also appear to control the temperature *differential* between the sea and the air.

Anyone care to speculate? (David: Your comment from the previous thread would be a good starting point for discussion if you would like to re-post it here.)