Global Temperature Update

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Temperature graphs that Makiko updates monthly are freely available on her web site, which includes various quantities, increasing as our research continues, updated at different intervals. Direct link to the temperature graphs is here. Sign up to receive e-mail notification of the monthly update on the home page of Climate Science, Awareness and Solutions or click here.

We did not send an update in July, because of changes in NOAA ocean data that we wanted to examine, comparing results based on prior and new data. Our global temperature analysis combines data from GHCN (Global Historical Climate Network, Menne *et al.*, 2012) for land, ERSST (Extended Reconstructed Sea Surface Temperature, Smith *et al.*, 2008) for ocean, and SCAR (Scientific Committee on Antarctic Research, Turner *et al.*, 2004) for Antarctica, as described by Hansen *et al.* (2010). We examine the changes below, but first we show two of our favorite graphs that are updated each month (under More Figures on the Temperature web page).

Figure 1 is the monthly global temperature anomaly and its running mean over 12-month, 60 month (5-year) and 132-month (11-year) periods. When we reach December the 12-month mean becomes the commonly reported annual mean. It is clear that 2015 will be the warmest year in the period of instrumental measurements, as an ongoing El Nino adds to a warming trend. We can already predict that the 2015 global temperature will exceed the prior warmest year (2014) by an unusually wide margin (~ 0.1°C), exceeding 1998 ("El Nino of the century") even further.

Figure 2 compares the first seven months of 2015 with the same period in 2010 and 2014, the two warmest prior years. Four of the seven months this year have been near or at record warmth. Annual 2015 global temperature will be about +0.8°C relative to 1951-1980 and about +1C relative to 1880-1920. Current warming should be stated as ~ +0.9°C relative to 1880-1920 based on the 11-year running mean, which effectively averages out the solar cycle and El Ninos.

Now let's examine the effect on global temperature of replacing ERSSTv3b with ERSSTv4. Changes of the SST record have a notable impact, even on global average temperature (Fig. 3). The changes add a small warming trend over the past 15 years, but make larger changes during 1920-1950 that alter the perception of climate change then (Fig. 3). Figure 4 shows the change.

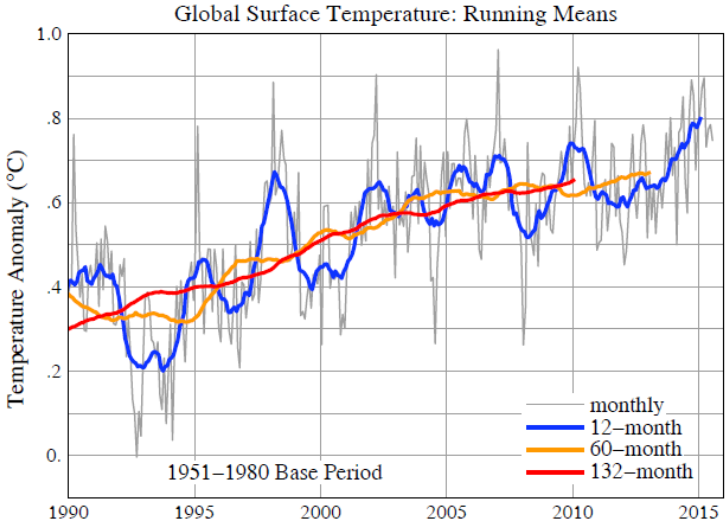

Fig. 1. Global temperature anomaly relative to 1951-1980 mean

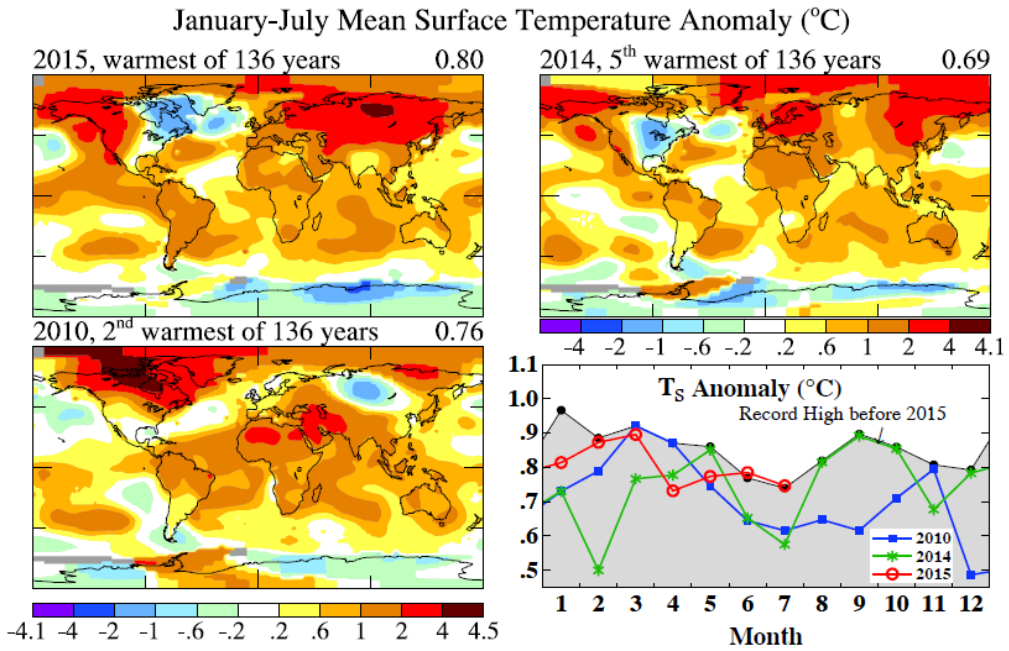

Fig. 2. Comparison of first seven months of 2015 with the same period of the two prior warmest years.

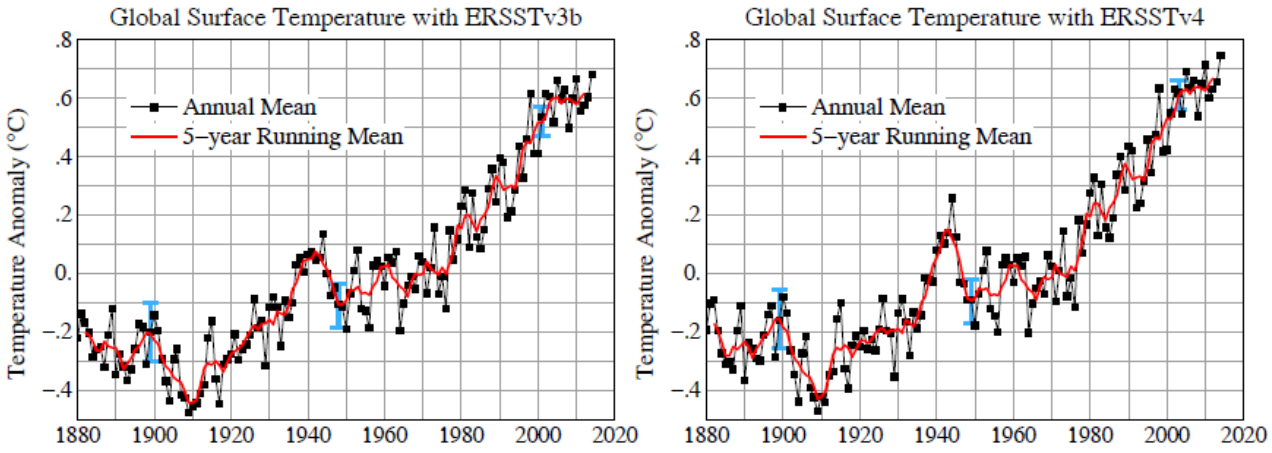

Fig. 3. Comparison of annual and 5-year-mean global temperature for ERSST version 3b and version 4.

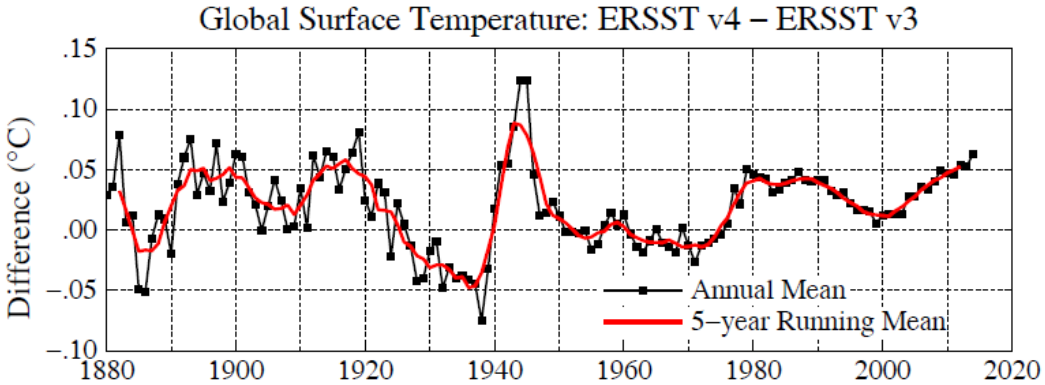

Fig. 4. Difference in the global temperature records between ERSST version 3b and version 4.

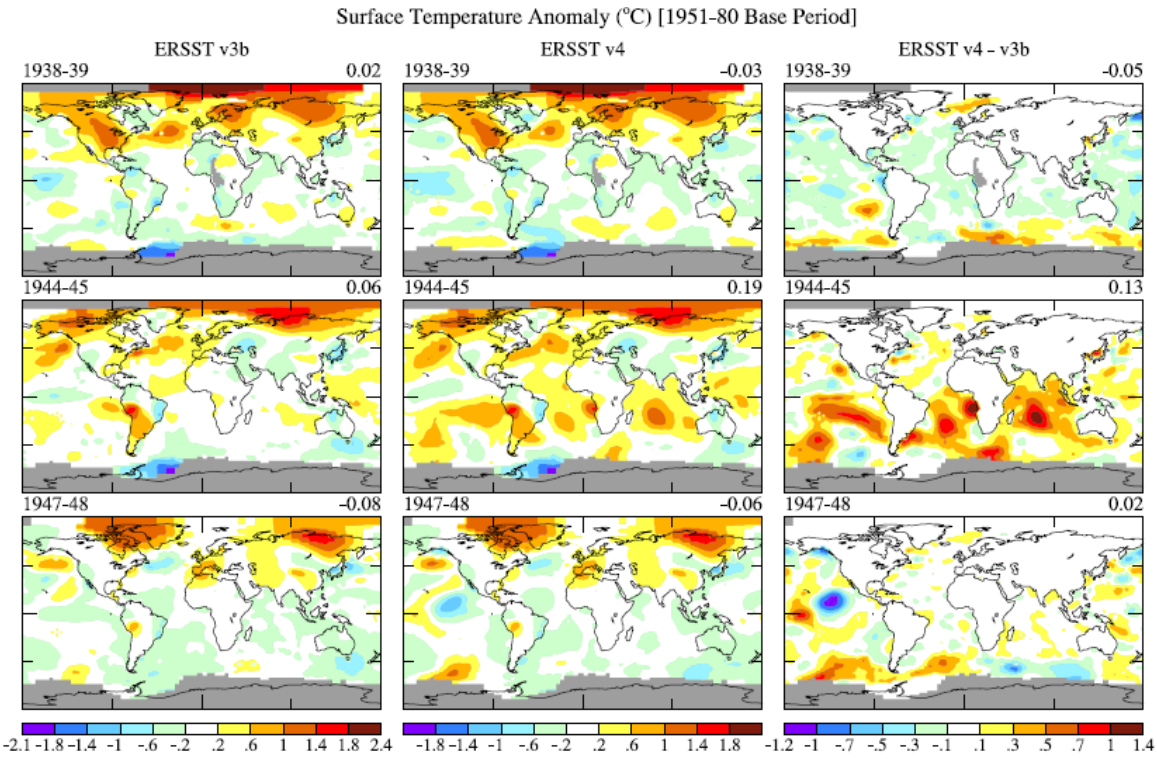

Fig. 5. Temperature anomalies in three periods relative to 1951-1980 mean for ERSST version 3b and version 4.

If the climate change between 1939 and 1944 shown in the right side of Fig. 3, a global warming of ~0.3°C, were real it would raise questions about the magnitude of unforced climate variability. However, we doubt the reality of this large warming peak. Note that the warm period coincides with World War II. Some insight is gained from maps of the temperature before, during and after the peak warm period. Figure 5 shows these maps for 1938-39, 1944-45, and 1947-48.

The sudden warming and then cooling of the Southern Hemisphere ocean raises suspicions about observing system changes. Temporal change can be measured with good accuracy if observing systems are homogeneous in time, even if absolute accuracy is limited. Observing systems, data quantity, and data quality surely were affected by the war. Changes between ERSST v3b and v4 included additional data sources as well as changes of bias adjustments (Huang et al., 2015).

We have not investigated further, but we suggest that the magnitude of the 1940s warm peak be viewed with caution. Concerns about data homogeneity are less for recent decades, so the main conclusions of Karl et al. (2015), using much the same data as v4, are unlikely to be affected.

References

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