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Is the global mean land surface temperature trend too low?

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The land temperature trend may be biased. In this study we want to present a number of recent results that suggest that the global mean trend might be stronger than generally thought.

In GHCNv3 the global land surface air temperature is estimated to have increased by about 0.8°C between 1880 and 2012. In the raw temperature record, the increase is 0.6°C; the 0.2°C difference is due to homogenization adjustments. Our current understanding is that homogenization will typically only be able to reduce trend biases.

Homogenization is less effective in regions (and periods) with sparse networks. If these regions have a trend bias then significant trend biases may remain even after homogenization. Therefore, the bias in the GHCNv3 global temperature trend may not have been fully removed by the 0.2°C homogenization adjustments.

Stations in sparse networks are representative for a larger region and are given more weight in the computation of the global mean temperature. If all stations are given equal weight, the homogenization adjustments of the GHCNv3 dataset are about 0.4°C per century.

In the subdaily HadISH dataset one break with mean size 0.12°C is found every 15 years for the period 1973–2013. That would be a trend bias of 0.78°C per century on a station by station basis. Unfortunately, these estimates strongly focus on Western countries having more stations.

National (regional) datasets can be better homogenized than global ones. We have compared the global collections BEST, CRUCY, CRUTEM4, GHCNv3 and GISS averaged their data over the region of several countries for which we also have well-homogenized national datasets. The national datasets show a stronger trend, which is several tenth of a degree Celsius per century larger and mostly statistically significant. The difference are smaller for CRU and GHCN than for BEST and GISS.