Development of Homogenized Global Land-Surface Daily Temperature Data

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This talk will discuss the development of Berkeley Earth's homogenized, gridded daily land-surface temperature product. The data set, derived with statistical methods from weather station observations, provides daily averages for mean, maximum, and minimum temperature across wide regions of the Earth. Where possible, provided time series begin as early as 1880.

Historically, most weather data has been collected for immediate use with little attention paid to ensuring consistency over time. As a result, most time series of weather observations suffer from discontinuities and biases due to changes in equipment, station location, and/or monitoring practices. The biases introduced, for example by moving a weather station from a city center to an airport, are often small compared to day-to-day weather variability but can be quite large compared to climatic trends. As a result it is necessary to correct raw weather station data for biases introduced as monitoring methods and equipment changes, a process known as homogenization.

The Berkeley Earth daily temperature product builds on the work of Berkeley Earth's well-established land-surface monthly data product. Rather than attempting to homogenize individual daily time series at full resolution (a problem whose computational complexity grows unmanageable by most methods), the daily product imports the homogeneity adjustments estimated for the monthly data set which uses the same weather stations. Daily gridded temperature fields are then constructed by treating daily observations as anomalies relative to the monthly averages and interpolating using Kriging-based methods. This allows for the creation of spatially extensive daily-temperature fields at a moderate resolution that are fully-consistent with the long-term climate reconstructions. The advantages and limitations of this approach will be discussed.

The results generated by the method will be compared to analyses of mean and extreme statistics generated by other means. In many cases, the homogenized daily dataset reveals subtle but significant differences from data sets constructed from raw weather station data without the consideration of homogenization.