FAQs on the Update to Global Historical Climatology Network–Monthly Version 3.2.0

Why did NCDC change to a new incremental version of GHCN-Monthly?
The software used to perform operational updates and reprocessing of GHCN-M version 3 was modified to correct coding errors and to improve its run-time efficiency. In particular, coding errors were corrected in the Pairwise Homogenization Algorithm (PHA) that had been identified during the course of a project led by Mr. Daniel Rothenberg in July 2011. The project was carried out as part of Google's "Summer of Code" and supervised by the Climate Code Foundation (with collaboration by NOAA/NCDC). These software changes were combined with other minor changes to improve debugging and processing efficiency. A total of eight software modifications were made.   The version number of the GHCN-Monthly temperature dataset was changed from 3.1.0 to 3.2.0 to reflect these changes in the processing system.

How does this version of GHCN-Monthly compare to the previous version?
The September 2012 release of v3.2.0 has no effect on the unadjusted (raw) data and little effect on global temperature rankings based on the adjusted data. However, the century-scale global land surface air temperature trend is higher using the adjusted v3.2.0 data. With v3.1.0, the adjusted annual global land surface air temperature trend for 1901-2011 was 0.94°C/Century. Using data from version 3.2.0 this trend is 1.07°C/Century. The greatest differences between the two versions of the adjusted datasets are in the data for years prior to 1970. There is little difference in the global surface temperature trend during the 1979-2011 period.

Why is the century-scale global land surface trend higher in version 3.2.0?
The PHA software is used to detect and account for historical changes in station records that are caused by station moves, new observation technologies and other changes in observation practice.   These changes often cause a shift in temperature readings that do not reflect real climate changes. When a shift is detected, the PHA software adjusts temperatures in the historic record upwards or downwards to conform to newer measurement conditions. In this way, the algorithm seeks to adjust all earlier measurement eras in a station's history to conform to the latest location and instrumentation. The correction of the coding errors greatly improved the ability of the PHA to find these kinds of historic changes. As a result, approximately twice as many changepoints (inhomogeneities) were detected in v3.2.0 than in v3.1.0. While the PHA makes adjustments upwards and downward to historic data in approximately equal numbers, the algorithm identifies the need for a slightly larger number of positive adjustments (which correct abrupt, artificial cool steps in a station's record) than negative adjustments (which correct warm step changes). While the adjustments for the v3.2.0 changepoints are on average smaller than v3.1.0, the greater rate of detection and correction resulted in changes to global land surface air temperature trends. Because there are more cold step changes (which require positive adjustments) than warm step changes (which require negative adjustments), most notably from the 1930s through 1970s, data for many years from the middle of the 20th Century and earlier have lower values in v3.2.0 than in v3.1.0. In brief, the global average land surface air temperature trends are higher in the adjusted data than in the unadjusted data and higher in v3.2.0 than in v3.1.0.

Why are there more cold (negative) step changes than warm (positive) step changes in the historical land surface air temperature records represented in the GHCN v3 dataset?
The reason for the larger number of cold step changes is not completely clear, but they may be due in part to systematic changes in station locations from city centers to cooler airport locations that occurred in many parts of the world from the 1930s through the 1960s.

Where can I obtain additional information about the changes that were made and their impacts on global temperature trends?
NCDC Technical Report *No. GHCNM-12-02* provides a detailed summary of each software modification and the resulting impacts to global temperatures. This report is available at
ftp://ftp.ncdc.noaa.gov/pub/data/ghcn/v3/techreports/Technical Report NCDC No12-02-Distribution.pdf

Is it possible to obtain the computer software code that NCDC uses for making homogeneity corrections?
Yes. The Pairwise Homogeneity Adjustment algorithm software is available online at
ftp://ftp.ncdc.noaa.gov/pub/data/ghcn/v3/software/ .