

Hourly Normals: Changes for 2014

This document details the changes in procedures used to produce the hourly normals between the original 2011 run and the update released in 2014. There are two differences in the processing discussed in the next two sections, followed by a comment regarding other differences that may be found in the end product. The new procedures were utilized to refresh the 1981-2010 hourly normals, as well as to release a new 2001-2010 version (e.g., 10-year averages) of the same hourly normals products. It is assumed that the reader is familiar with the concept of normals in general (Arguez et al., 2012) and particularly the hourly normals (Applequist et al., 2012). Please see the second of these references to put the following in proper context.

Station selection and dataset composition

In 2011 for our first effort at hourly normals, we chose a list of stations that were known as "first order stations," a collection of locations typically at major airports for which hourly observations were taken from 1981 to 2010. This was meant to be a representative, rather than comprehensive, sampling of US data. Beginning with a list of 273 stations, we attempted to find complete records in the ISD-lite data. 262 stations were found, though these were not entirely from the original list of 273. For example, the current Denver International Airport opened in the mid-1990s and lacked sufficient data to compute 30 year normals. The nearby Buckley Air Force Base was introduced as a substitute. Additionally, the airport in Austin, TX was also relocated in the mid-1990s. To establish a nearly complete 30 year record representative of the hourly values in the center of Austin, we combined records for Mueller Airport and Camp Mabry. A second site south of the city uses merged records from the former Bergstrom Air Force Base and current commercial airport. All stations were required to have data in 27 of the 30 possible years, but no further checks for data completeness were performed.

The primary reason to re-compute the 1981-2010 normals in 2014 was to make them compatible with the results of a parallel effort to compute normals for the years 2001-2010. We wished to use as many stations as possible while avoiding the ad hoc and manual process used to compile station datasets for the 2011 version of the 30 year normals. An automated method was designed and applied to the entire set of US controlled ISD-lite records. First, the entire catalog of ISD-lite stations was searched for candidates with data in the desired year range. Data file names sharing the same valid AWS and WBAN identifiers were combined. For example, these three data files would be merged into one record: 123456-12345-1990, 123456-99999-1990, 999999-12345-1990. No other combinations were made. As such, for the period 1981-2010, the previously mentioned Buckley Air Force Base was automatically selected and no location had sufficient data for Austin, TX.

Assuming that hourly temperature normals were the most popular products, locations that were candidates for normals were required to have valid hourly observations more than 70% of the time. Furthermore, after computing the normals, those stations with less than 95% of the hourly temperature normals computed were discarded. The locations for which normals were computed in 2011 but failed the new criteria were still included (e.g. two locations in Austin, TX and Mt Washington, NH). Hourly normals for 1981-2010 are now provided for 457 stations, up from 262 in the original 2011 release. In addition, 2001-2010 hourly normals are available for 887 stations.

Percentage of calm winds

In 2011 when sampling the wind values to compute the frequency of calm winds, the calculation was done in conjunction with wind direction frequencies. As such, we required that for a wind vector to be considered, it must have valid values for both speed and direction. This resulted in discarding valid wind cases of the "light and variable" variety for which the wind speed was valid and the direction was reported with the "missing" flag value. In the 2014 version, the aforementioned requirement to have a valid direction was removed resulting in small, typically a few percent, increases in the frequency of calm winds. Average wind speed calculations were not affected.

Other differences

Other differences that might be found between the 2011 and 2014 versions of 1981-2010 normals are attributed to the dynamic nature of the ISD-lite database. Typically, however, there are no differences in the normals values, or differences of 0.1 or 0.2°F and similar differences for other computed values.

References

- Applequist, S., A. Arguez, I. Durre, M. F. Squires, R. S. Vose, and X. G. Yin, 2012: 1981-2010 U.S. Hourly Normals. *Bull. Amer. Meteor. Soc.*, **93**, 1637-1640.
- Arguez, A., and Coauthors, 2012: NOAA'S 1981-2010 U.S. CLIMATE NORMALS An Overview. *Bull. Amer. Meteor. Soc.*, **93**, 1687-1697.