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Steps Towards a Homogenized Sub Monthly Temperature Monitoring Tool

Jared Rennie and Kenneth E. Kunkel
Cooperative Institute for Climate and Satellites, North Carolina State University, Asheville, North Carolina

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Overview

Land surface air temperature products have been essential for monitoring the evolution of the climate system. Before a temperature dataset is included in such reports, it is important that non-climatic influences be removed, such as changes in station location, instrumentation, and observing practices. Very few datasets are free of these influences and therefore require homogenization. Many monthly homogenized products exist, however smaller temporal scales are challenging, since a detected break may be associated with a true inhomogeneity, or by chance variation in the data due to natural variability.

The Global Historical Climatology Network – Daily dataset (GHCN-D; Menne et al. 2012) provides a strong foundation of the Earth's climate on the daily scale. While the dataset adheres to a strict set of quality assurance, no daily adjustments are applied. As this dataset lays the groundwork for other homogenized products distributed at the National Centers for Environmental Information (NCEI), including the climate divisional dataset (nClimDiv; Vose et al. 2014), it makes sense to combine them to provide a sub monthly monitoring tool for the U.S.

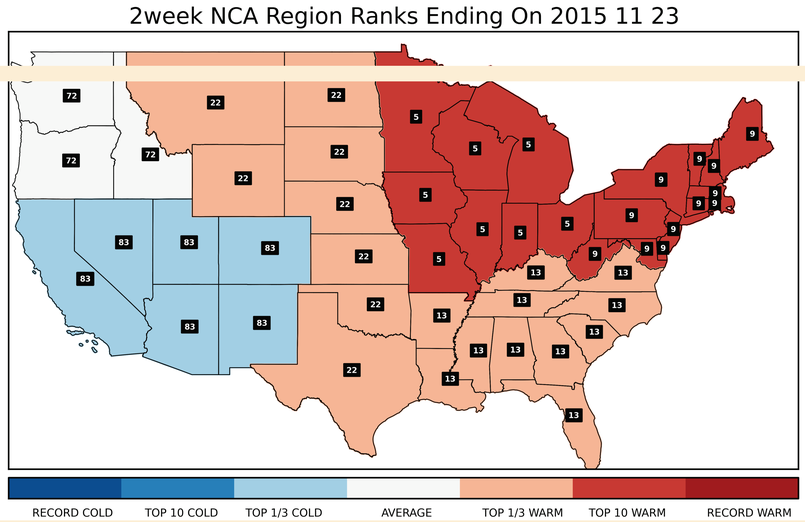
Using existing datasets, monthly adjustments are applied to daily data to account for non-climatic influences. Station data is then aggregated to various regions and ranked against its period of record through probability density functions. This methodology assumes that by aggregating to larger regions, we are minimizing the risk of incorporating the daily variability of homogeneity adjustments. In addition, by limiting the temporal scale to no less than 3-days, we are assuming that any time of observation bias would be filtered out, although this may not always be the case. Because of these assumptions, this product is meant as a source of general public information, and more work needs to be done before it is suitable for scientific trend analysis.

REFERENCES
Menne, M.J., et al., 2012: An Overview of the Global Historical Climatology Network-Daily Database. *J. Atmos. Oceanic Technol.*, **29**, 897–910.

Vose, R.S., et al., 2014: Improved Historical Temperature and Precipitation Time Series for U.S. Climate Divisions. *J. Appl. Meteor. Climatol.*, **53**, 1232–1251.

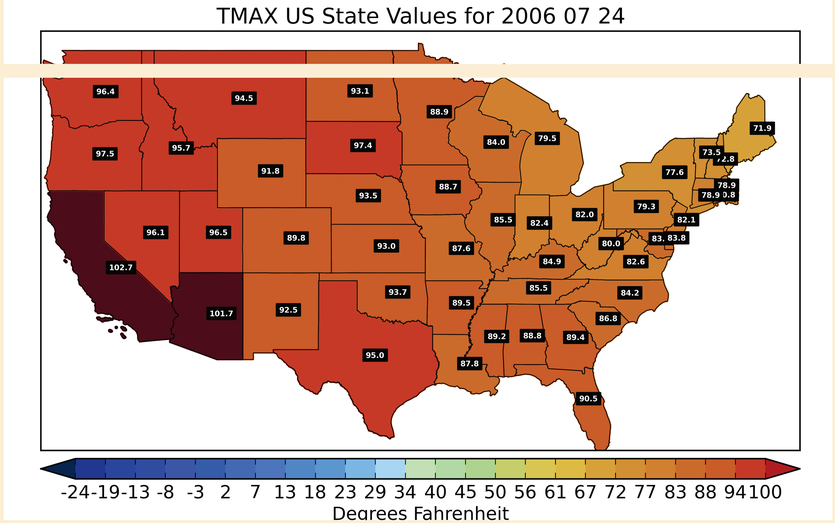
MONITORING LATEST DATA

Below are temperature ranks for regions defined by the National Climate Assessment. Ranks range between 1 (record warm) and 121 (record cold). Values based upon temperatures recorded from November 10th to November 23rd (two weeks).



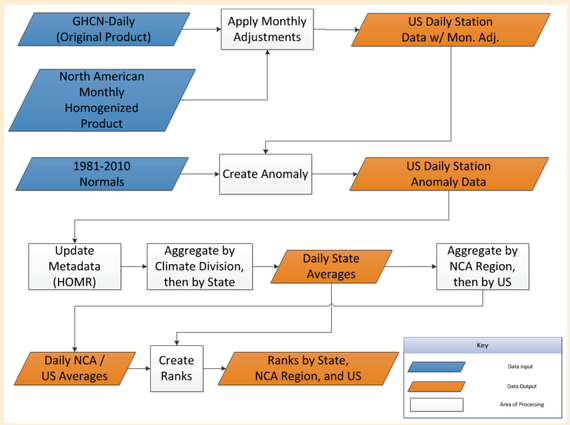
ARCHIVED ANALYSIS

The dataset goes as far back as 1895, therefore, this product can be used to describe how significant events were in historical context. Below are homogenized maximum temperature values for each US state during the July 2006 heat wave.



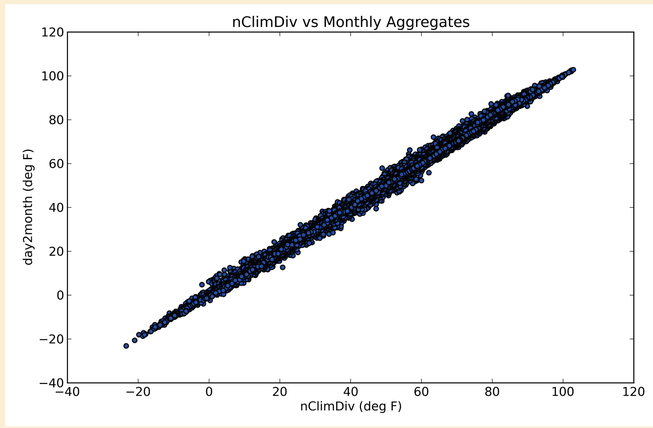
NIGHTLY PROCESSING

Flow diagram describing the process run nightly to generate the monitoring tool. Datasets used noted in blue.



VALIDATION

Daily homogenized data aggregated to the monthly scale and state scale, compared to values in nClimDiv (Vose et al. 2014).



RANKING SYSTEM

Ranks for Northwest NCA region (Washington, Oregon, Idaho) ending on November 11th, 2015

Duration	# Years	Rank	Value	Anomaly
3-day	121	79	37.3	-1.3
4-day	121	73	38.2	-0.6
1-week	121	75	38.1	-1.2
2-week	121	44	41.8	1.4
3-week	121	29	43.7	1.8
1-mon	121	8	47.0	3.4
3-mon	121	4	55.9	2.7
6-mon	121	1	61.0	3.6
9-mon	121	1	55.7	3.6
1-year	120	1	50.4	3.7

WEBSITE: http://monitor.cicsnc.org/sub

CONTACT: jared@cicsnc.org | http://about.me/jjrennie

CICS – NC
Cooperative Institute for Climate and Satellites – North Carolina
National Oceanic and Atmospheric Administration
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