

## ACCESSING NOAA DAILY TEMPERATURE AND PRECIPITATION EXTREMES BASED ON COMBINED/THREADED STATION RECORDS

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### ABSTRACT

Daily records of both temperature and precipitation are of great interest to the public and many data users and are beneficial in climate perspectives. However, numerous station relocations over the years have resulted in inconsistent approaches to combining multi-location data sets. The outcome from this situation is disparate reporting of record and extreme values at many prominent large metropolitan observing sites. To address this challenge, the methodology for establishing multi-location combined (or threaded) station data sets under the so-called “*ThreadEx*” project is presented.

### 1. INTRODUCTION

In the interest of ensuring consistent reporting of climatological data, NOAA's National Climatic Data Center (NCDC), in partnership with the Northeast Regional Climate Center (NRCC), NOAA's National Weather Service/Climate Services Division (NWS/CSD), and numerous data users, has established a data set of combined (or threaded) period of record daily temperature and precipitation values at 255 NOAA published *Local Climatological Data (LCD)* locations that generally correspond to most medium- and large-sized cities in the United States. This new ThreadEx data set provides a consistent basis for the reporting of daily extremes for the longest meaningful period of time. The development of this data set is especially timely given the increasing availability of historic daily values in digital form for the first half of the 20th century (and earlier in some cases) (Kunkel *et al.*, 1998; Guttman, 2002).

Many research applications rely on using a variety of homogenization techniques to account for non-climatic shifts resulting from station relocations, changes in instrument type, and variations in the time of observations (DeGaetano *et al.*, 2002). The ThreadEx project aims to report the *actual* values for a given region mapped to a given published LCD site for the express purpose of conveying general climate perspectives information. Thus, the daily values are preserved in spite of siting changes.

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### 2. METHODOLOGY

Threads for a given published LCD site will be developed as follows. The record of a currently active station will be the starting point for a station thread. This station's current record will be used as far back in time as possible, taking precedence over a closed station's record during any periods of overlap. A search will be conducted to identify other weather stations in the region that can be used to extend the thread further back in time. In this process, the thread will be extended back in time as far as possible using NOAA daily data available in digital form. Preference will be given to Weather Service/Weather Bureau stations (that are not themselves LCD stations) over COOP stations.

For historic overlaps, all else being equal, the station with a more recent record will take precedence, unless partner input (*e.g.*, NWS field offices, State Climatologists, *etc.*) with compelling documentation determines otherwise. An attempt will be made to fill any gaps larger than six months in a station record with data from another station. Partner input will be sought during the development of this data set through a survey. The period of record used for each portion of a thread will be clearly denoted in the station meta-data.

An example of a station thread for the Chicago area would be:

<i>Chicago O'Hare AP</i>	<i>11/1/1958 - present</i>
<i>Chicago Midway AP</i>	<i>1/1/1942 - 10/30/1958</i>
<i>Chicago University</i>	<i>1/1/1926 - 12/31/1941</i>
<i>Chicago WB City</i>	<i>1/1/1896-12/31/1925</i>
<i>Chicago (CRB)</i>	<i>10/9/1871-12/31/1895</i>

### 3. DATA SET ACCESS

The threaded data will be available in two formats:

- On xmACIS (the NWS interface for climate record queries) and other systems using the ACIS database (<http://www.rcc-acis.org/>), the threaded data station daily values will be fully available for query; thus, all data summaries currently available in xmACIS can be applied to this data set. These stations will be clearly identified as threaded stations.

The benefit of an extended record is illustrated using xmACIS output in Table 1. Presently, the Washington,

DC record at Reagan National Airport extends back to 1948. With ThreadEx, daily extremes will be extended back to the 1890s using pre-1948 Weather Bureau station observations, allowing climate perspectives inquiries such as determining the coldest/warmest/wettest Inauguration Day for a substantially longer period of record.

- Another data set containing summary tables for extremes will be produced. This will consist of the three most extreme records per calendar day for maximum temperature (highest and lowest), minimum temperature (highest and lowest) and precipitation (highest). Metadata will consist of station information for the station fragments composing the thread. The period of analysis will consist of the earliest data available in digital form through the end of 2004.

**Table 1. Sample xmACIS Output with i.) Current Period of Record (POR) and ii.) ThreadEx Extended POR (preliminary)**

WASHINGTON REAGAN NATIONAL AP (KDCA)		
Extremes		
Highest Daily Maximum Temperature		
Days: 1/20 - 1/20		
Length of period: 1 day		
i.) Years: 1948-2005		
Rank	Value	Ending Date
1	70.0	1/20/1951
2	60.0	1/20/1954
2	60.0	1/20/1952
4	59.0	1/20/1963
ii.) Years: 1873-2005		
Rank	Value	Ending Date
1	70.0	1/20/1951
2	64.0	1/20/1907
2	64.0	1/20/1890
2	64.0	1/20/1880

#### 4. FUTURE DEVELOPMENT AND UPDATE

A national oversight committee is in the process of being formulated to oversee future updates to the Threaded Extremes Data Set. This committee will include representatives from Regional Climate Centers, AASC, NCDC, NWS field offices, NWS regional offices and NWS Headquarters. This committee will also be

charged with making determinations in situations where a partner requests an exception be made to the methodology outlined above.

The table derivatives of the data set will be updated on an annual basis to include calendar year updates and extension of period of record based upon digitized daily data rescued from NOAA archives and offices as they are documented (including metadata such as latitude, longitude, elevation, station/instrument and other siting characteristics, etc.), quality assured, and made available. The xmACIS data values will be updated in real time on a daily basis.

#### 5. CONCLUSION

NOAA's commitment to excellence in climate services is punctuated by its synergies with partners in developing data feedback, quality assurance, and dissemination infrastructure. With the ThreadEx effort, maximized, consistent, updated daily extremes will be available for government, partner, and general public (especially media) use. The consistent use of such information will make clear regional extremes and lay the foundation for the expansion of this technique to additional locations and parameters.

#### 6. REFERENCES

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