4.5 A COMPARISON OF THE ORIGINAL UNITED STATES HISTORICAL CLIMATOLOGY NETWORK (USHCN) AND USHCN V2

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The U.S. Historical Climatology Network (USHCN) project began in 1983 to provide long-term homogeneous monthly temperature and precipitation series across the United States. Originally the algorithm to detect discontinuities associated with observation practice changes was based solely upon the metadata archives. In addition long-term digital temperature data from only the 1221 USHCN stations, selected for their length of record and higher quality, were used for the evaluation of relative changepoints. The original algorithm was based upon a comparison of each target temperature series to the average from surrounding USHCN stations. A *t*-test was used to evaluate the likelihood of an undocumented discontinuity at the time of each documented station change contained in the archives. After extensive digitization and quality control of monthly station data, the original USHCN was released in 1987. Although the metadata archives were known to be incomplete, the original USHCN release did not contain an evaluation of undocumented changepoints. In addition, seasonal adjustments were applied to monthly data, which limited the sample size available to adjust one segment of a station's temperature record relative to another.

During the intervening 17 years, the evaluation of undocumented changepoint detection and adjustment has become more commonplace in the field of climatology. Consequently, a new version of the USHCN temperature dataset contains an evaluation of both documented and undocumented changepoints. Specifically, the new USHCN changepoint algorithm identifies probable undocumented changepoints as well as tests for possible discontinuities at the time of practice changes identified by the metadata. In addition, a station to station (pairwise) comparison of temperature series is conducted to more reliably attribute a changepoint to the series being evaluated. The current availability of digitized records from more than 8000 U.S. Cooperative Observer Network stations, especially from the early 20th Century, courtesy of the Climatic Data Modernization Project (CDMP), improves the likelihood of detecting relative changepoints.

This presentation compares the adjusted maximum and minimum monthly temperature series from Version 2 with series processed using the original USHCN undocumented changepoint adjustment algorithms. Since the effects of most undocumented changepoints are random, many of the discovered inhomogeneities in the original USHCN are random fluctuations around the Version 2 solution as seen as differences with respect to an average of the nearby stations (Fig 2a). However, the timing of the changepoints can impact the calculation of trends during the period of record (Fig 2b). Here we discuss the impact of incorporating undocumented changepoint detection algorithms in the Version 2 release, particularly regarding the calculation of regional and national trends.

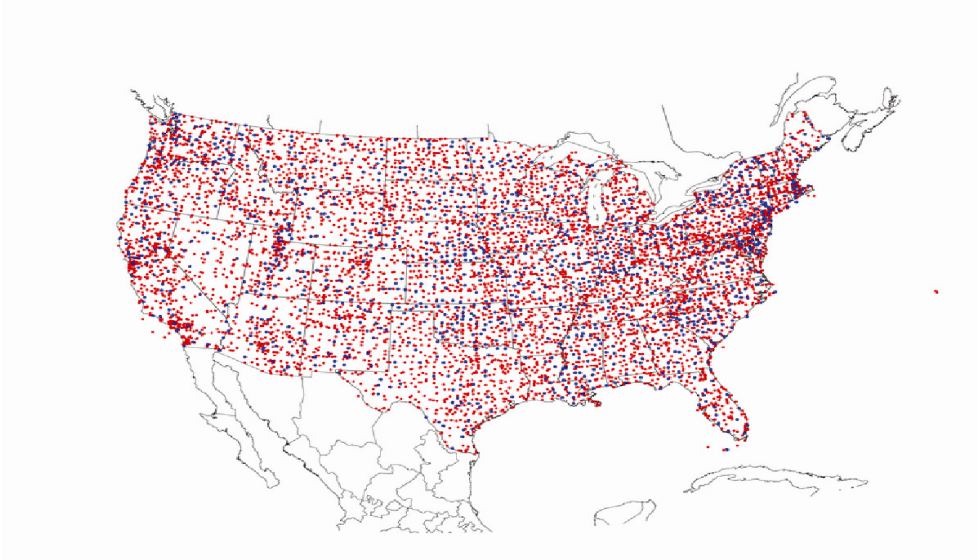

Fig. 1 – Distribution of the USHCN stations (blue) and the US Cooperative/CMDP Network (red) used for pairwise comparison of temperature series and adjustment of relative (artificial) changepoints.

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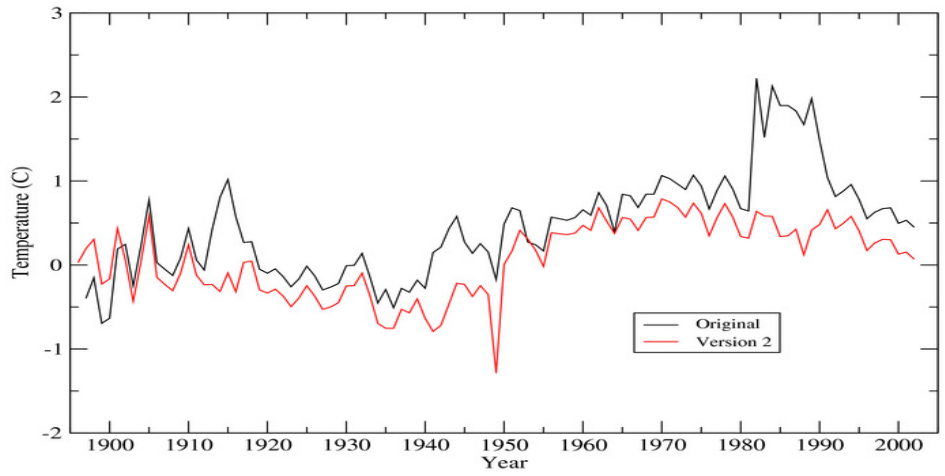

Fig. 2a – Pine River Dam, MN (216547) comparison with the surrounding stations

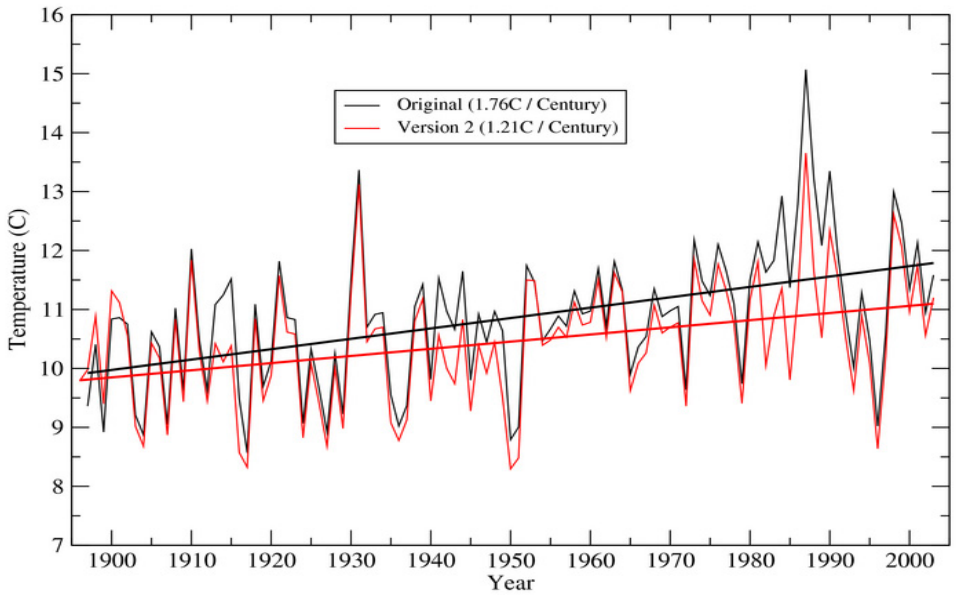

Fig. 2b – Full series with linear trend calculated for Pine River Dam, MN (216547)