Benchmarking the performance of daily temperature homogenisation algorithms

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This work focuses on the results of a recent daily benchmarking study carried out to compare different temperature homogenisation algorithms; it also gives an overview of the creation of the realistic synthetic data used in the study. Four different regions in the United States were chosen and up to four different inhomogeneity scenarios were explored for each region. These benchmark datasets are beneficial as, unlike in the real world, the underlying truth is known a priori, thus allowing definite statements to be made about the performance of the algorithms run on them. Performance can be assessed both in terms of the ability of algorithms to detect changepoints and to correctly remove the inhomogeneities the changepoints create. The focus is on daily data, thus presenting new challenges in comparison to monthly data and pushing the boundaries of previous studies.

The aims of this work are to evaluate and compare the performance of various homogenisation algorithms, aiding their improvement and enabling a quantification of the uncertainty remaining in the data even after they have been homogenised. An important outcome is also to evaluate how realistic the created benchmarks are. It is essential that any weaknesses in the benchmarks are taken into account when judging algorithm performance against them. This information will in turn help to improve future versions of benchmarks. Here I present a summary of this work including an overview of the benchmark creation and the algorithms run and details of the results of this study. This work formed a 3 year PhD and feeds into the larger project of the International Surface Temperature Initiative which is working on a wider scale and with monthly instead of daily data.