

## Parallel measurements to study inhomogeneities in daily data

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Daily datasets have become a focus of climate research because they are essential for studying the variability and extremes in weather and climate. However, long observational climate records are usually affected by changes due to nonclimatic factors, resulting in inhomogeneities in the time series. Looking at the known physical causes of these inhomogeneities, one may expect that the tails of the distribution are especially affected. Fortunately, the number of national and regional homogenized daily temperature datasets is increasing. However, inhomogeneities affecting the tails of the distribution are often not taken into account.

In this literature review we investigate the physical causes of inhomogeneities and how they affect the distribution with respect to its mean and its tails. We review what is known about changes in the distribution from existing historical parallel measurements. We discuss the state of the art in the homogenization methods for the temperature distribution. Finally, we provide an overview of the quality of available daily datasets that are often used for studies on changes in extremes and additionally describe well-homogenized regional datasets.

As expected, this review shows that the tails of the distribution are more affected by changes in monitoring practices than the means. Many often-used daily datasets are not homogenized (with respect to the distribution). Given the strong interest in studying changes in weather variability and extremes and the existence of often large inhomogeneities in the raw data, the homogenization of daily data and the development of better methods should have a high research priority.

This research would be much facilitated by a global reference database with parallel measurements. The climate community, and especially those involved in homogenization, bias correction and the evaluation of uncertainties, should take an active role to foster the compilation of such a reference database. We have started an initiative collecting parallel datasets. Its aims will be explained and its progress will be presented.