



## 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, all long observational climate records are usually affected by changes due to nonclimatic factors and looking at the known physical causes of inhomogeneities, one would even expect that many causes especially affect the tails of the distribution. Fortunately, the number of national and regional homogenized daily temperature datasets is increasing, but still many daily datasets are not homogenized or limited to adjustments on the mean of the distribution.

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 parallel measurements with historical measurement setups. We discuss the state of the art in the homogenization of the distribution and provide an overview of the quality of available datasets that are often used for studies on changes in extremes and of well-homogenized dataset.

As expected, this review shows that the tails are even more affected by changes in monitoring practices than the means. Given the strong interest in studying changes in variability and extreme weather and the strong inhomogeneity 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 reference database.