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. Although the number of national and regional homogenized daily temperature datasets is increasing, inhomogeneities affecting the tails of the distribution are often not or insufficiently 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 effects of the state-of-the-art homogenization methods on 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 provides evidence that the tails of the distribution are generally more affected by non-climatic changes than the means. This is a problem because the question to which extent daily homogenization methods can reduce those effects is insufficiently studied and most available methods are focused on temperature only. More specifically, it is advised to study whether the current deterministic correction methods should be succeeded by stochastic methods. Concerning the large scale available daily datasets, many of them are not homogenized (with respect to the distribution), whereas the number of national and regional homogenized datasets is strongly growing.

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.