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Challenges of daily data homogenization

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In recent years the growing demand of extreme value studies has led to the development of methods for the homogenisation of daily data. The behaviour of some of these methods has been investigated: Two methods (HOM: Della-Marta and Wanner, 2006 and SPLIDHOM: Mestre et al., submitted) which adjust the whole distribution of the climate element (especially minimum and maximum temperature) have been compared to the simpler Vincent's method (Vincent et al., 2002) which interpolates monthly adjustment factors onto daily data. The results indicate that the behaviour of the methods HOM and SPLIDHOM is very similar, although the complexity of these methods is different. They can improve the results compared to the Vincent's method when inhomogeneities in higher order moments occur. However, their applicability is limited since highly correlated neighbour series are required. More over, more data in the intervals before and after breaks is needed if the whole distribution shall be adjusted instead of the mean only. Due to these limitations a combination of distribution dependent adjustment methods and the Vincent method seems to be necessary for the homogenization of many time series.

A dataset of Austrian daily maximum and minimum temperature data is used to illustrate the challenges of distribution dependent homogenization methods. Emphasis is placed on the estimation of the (sampling) uncertainty of these methods. Therefore a bootstrap approach is used. The accuracy of the calculated adjustments varies mainly between about 0.5°C for mean temperatures and more than one degree Celsius for the margins of the distribution. These uncertainty estimates can be valuable for extreme value studies.