



A potential new method of homogenising daily temperature data

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This paper describes a potential new methodology for homogenising daily temperature data and presents a number of examples using long-term daily temperature records from around Europe. The method not only adjusts the mean of each series but also the higher order moments such as the dispersion and skewness characteristics based off comparisons with regional reference series. Central to the technique is the method of L-Moments, a robust way to estimate probability density functions (PDF) with small samples. The method consists of three main parts. Firstly a two-phase regression model is used to assess the monthly and annual homogeneity of the temperature series. The homogeneity test is performed on the difference series between the candidate station series and a weighted reference series of surrounding highly correlated series. Results show that after comparison with available metadata over 50% of the stations investigated contain more than one highly significant inhomogeneity in their monthly means. Secondly the monthly candidate series mean is adjusted based on inhomogeneities identified in the previous step. This is typical of many studies that have homogenised climate data. However there are few studies that have applied these adjustments to the daily data because of concerns that the adjustments do not consider inhomogeneities that may still exist in the extreme parts of a candidate stations' probability distribution. The third part of the method examines the PDF of the candidate station at each partially-homogenised sub-period between the inhomogeneities identified in step one and compares these to the PDFs of climatically similar surrounding reference series. Climatically similar stations are identified using the L-Moments and regional frequency analysis methodologies of Hosking (1997). Where the candidate series' PDF changes between the homogeneous sub-periods in a manner that is not supported by the changes in the regional reference series' PDF then adjustments to

the candidate series' daily PDF are made. There are details in this method that cause uncertainties in the higher order moment adjustments such as the fact that normally the reference series have not been homogenised before being used and other subtleties of the regional frequency analysis technique that will be discussed further.

Hosking, J.R.M. Wallis, J.R. Regional frequency analysis: an approach based on L-moments. Cambridge University Press, Cambridge, U.K., 1997