



Robust trend analysis in temperature time series data

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This paper deals with the estimation of trends in temperature series and on the computation of associated confidence intervals. We follow two main approaches that enable the researcher to derive confidence intervals that are reasonably robust to potential misspecification of the underlying time series model using on the one hand sub-sampling techniques, and on the other hand variance semi-parametric corrections for the variance estimator. Given the usual uncertainty about the most suitable model, different methods of obtaining point estimates and corresponding confidence intervals, which are robust to misspecification of underlying dynamics, are compared using Monte Carlo simulations.

Both approaches are then used for the estimation of a time trend in the temperature time series data series for various European cities. The sample consists of annual mean temperature data from 37 cities with a range from 1830 until 2006. A significant rise in the temperature can be detected for most series, for most of the cities this average yearly temperature increases lies between 0.002 and 0.015 degrees Celsius. The analysis is further extended by considering the possibility of a structural break in the trend component using a robust inference techniques with unknown break point. The results show that almost all temperature series display a strong positive structural break in the trend although less than half of them turn out to be significant.