Estimation on urban trends on non-homogeneous series: the Viennese UBRIS experiment

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The influence of urban trends on temperature series is difficult to estimate by means of non-homogeneous series. The usual way to proceed is to split the dataset into two groups, non-urban and urban stations, homogenize them separately, and compare the two groups. This may be problematic when only few or just one series per group is available, which is often the case on longer time scales.

Our approach relies upon a joint estimation of trends and break amplitudes of the series. A first phase, the detection of abrupt change-points is performed as usual using pair-wise comparisons and change-point detection criteria.
The correction of series is then performed by means of a modified ANOVA model. In this model, the possibility of extra trends is given on subperiods of the series.

Which series, and which part of the series are affected by the trends has to be provided by the a priori knowledge of the climatologist.

Once those periods are set, the estimation and significance testing of urban trends is straightforward.

This approach is validated on Vienna temperature series (UBRIS experiment), Vienna different phases of urban growth being well documented.

Our results were comparable to a previous study established by Böhm (1998), with surprising results: central Vienna series exhibit no urban trend, as well as rural series. Only suburban series exhibit significant (and large) urban trends. The series from the historic centre show a constant urban temperature surplus but no additional urban trend.