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Testing of homogenisation methods: reproduction of trend-slopes caused by climatic changes in linear regression

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Efficiencies of 15 objective homogenisation methods [OHOMs] are under investigation. Reliability of slopes of linear trends of homogenised time series is evaluated with the use of simulated datasets. The fifteen OHOMs are: 2-2 versions of the Bayes-test, Buishand-test, Standard Normal Homogeneity Test (SNHT) and t-test, as well as the Caussinus - Mestre method, Easterling - Peterson method, Mann - Kendall test, Multiple Analysis of Series for Homogenisation (MASH), Multiple Linear Regression, Pettitt-test and Wilcoxon Rank Sum Test. As the inhomogeneities [IH] in simulated datasets are known, the efficiency can be objectively calculated. However, there are some factors which may limit the validity of the calculated efficiencies. They are a) statistical properties of IH populations in simulated time series which may quite different from those of the real datasets, b) way of the efficiency evaluation, c) parameterisation of OHOMs. - In the present work a large variety of test datasets is used to assess the effect of test dataset choice on the efficiency results. This variety contains very simple datasets comprising components of a white noise process and 1-2 IHs per time series only, datasets of medium complexity comprising white noise plus a few IHs of randomly distributed magnitudes, and datasets with large number of different size IHs, as the latter case approaches best the properties of climatological datasets from observations. The parameterisations of OHOMs are standard or optimized.

Results show that a) Reproducing climatic trends is a very different expectation from the usual one, i.e. from identifying IHs one-by-one with the possibly highest reliability. The rank order of efficiencies of OHOMs can be very different according to

the fulfilment of different expectations; b) The reliability of homogenised time series is better than that of the raw time series with only very few exceptions; c) The rank order of efficiencies of OHOMs strongly depends on the statistical properties of the test dataset; d) Mostly the Caussinus-Mestre method performs best, followed by the MASH and the Bayes-test.