Geophysical Research Abstracts,
Vol. 11, EGU2009-10948, 2009
EGU General Assembly 2009

Homogenization of climatic series via pairwise comparisons: An automated Bayesian algorithm

A. Hannart (1), O. Mestre (2), and P. Naveau (3)

(1) LOCEAN, Institut Pierre-Simon Laplace, CNRS/IRD, France (alexis.hannart@locean-ipsl.upmc.fr), (2) Météo France (olivier.mestre@meteo.fr), (3) LSCE, Institut Pierre-Simon Laplace, CNRS/IRD, France (philippe.naveau@lsce.ipsl.fr)

We describe an automated homogenization algorithm based on pairwise comparison of neighbouring station series. In homogenization, such pairwise comparison techniques avoid falling back on regional reference series, which potential non homogeneity is often considered a drawback. While they efficiently mitigates this issue, pairwise comparison techniques implementation cost is nevertheless higher for several reasons: first, the set of series to be scanned for shifts is larger since each candidate series may have several neighbours; second, each shift detected on a paired difference series may be caused by any two series and must hence be attributed to the culprit series; third, multiple shift locations an amplitudes estimated on several paired difference series must be reconciled into a unique position and amplitude to be used for adjusting the candidate series. High resulting implementation cost of pairwise comparison may thus prohibit its use when stations are many. To cope with this issue, the algorithm described here deals with each of these three steps in a completely automatized way; in particular it does not involve visual inspection in the first step, nor does it defer the second and third steps to a time consuming manual review by an analyst as most previous methods do (Caussinus and Mestre, 2004). The algorithm rely on a Bayesian multiple change-point detection technique (Hannart and Naveau, 2008) to cope with the first step, a method which benefits from expert knowledge on jumps amplitude and frequency introduced through prior distributions. Then, the algorithm takes advantage of posterior distributions obtained from this Bayesian method to quantify the uncertainty on the position and amplitude of shifts. Simple quantitative criterion are derived from these posterior distributions and probabilities to attribute all detected shifts to a culprit series and reconcile disparities in estimates of their position and amplitude, both of which are automatically performed through explicit and simple calculations. The algorithm is tested on real and simulated series leading to considerably improved processing time yet with a similar performance level, compared to manually reviewed pairwise comparison techniques.