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Homogenization of daily temperature series: methods and applications

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Data quality control and homogenization are essential tasks to be performed before any climate change analysis. They help identifying and removing (or reducing) the effects of non-climatic factors, as station relocation or instrumentation changes. Regarding the break point detection, a new procedure based on a Genetic Algorithm and Hidden Markov Models (GAHMM) is developed for changes in the mean and variance. Simulations confirm that GAHMM performs well in the identification of multiple shifts; moreover, it can be easily adapted to different initial assumptions on series and variables under investigation. As for the correction of inhomogeneities, an improved method, named Higher Order Moments for Autocorrelated Data (HOMAD), based on the well-known HOM method (Della-Marta and Wanner, 2006) has been implemented. It takes into account data autocorrelation both in the estimation of the regression function and cumulative distributions.
GAHMM is applied together with the method of Caussinus and Mestre (2004) and RH-test (Wang et al., 2007) to a set of 246 daily series of maximum and minimum temperature recorded in the eastern Mediterranean from 1960 to 2006. The detected inhomogeneities are corrected with HOMAD.