New version MASHv4.01 for joint homogenization of mean and standard deviation

Tamás Szentimrey

Varimax Limited Partnership, Budapest, Hungary (szentimrey.t@gmail.com)

The earlier versions of the method MASH (Multiple Analysis of Series for Homogenization; Szentimrey) were developed formerly at the Hungarian Meteorological Service. These procedures aimed to homogenize the daily and monthly data series in the mean i.e. the first order moment. The new version MASHv4.01 has been developed for joint homogenization of mean and standard deviation using some mathematical results.

Theoretically in case of normal distribution the homogenization of mean and standard deviation is sufficient since if the first two moments are homogenous then the higher order moments are also homogeneous.

The new procedure is based on the examination of several types of monthly series and the main steps for monthly series are as follows: break points detection and estimation of inhomogeneity of standard deviation, adjustment of monthly mean series in standard deviation, break points detection and estimation of inhomogeneity of mean, adjustment of monthly mean series in mean.

Homogenization of daily series in mean and standard deviation is based on the monthly results. We think that the monthly series are more appropriate for the estimation of inhomogeneity than the daily series as a consequence of the larger signal to noise ratio.

In addition we remark that the homogenization of monthly mean series in standard deviation is not an unnecessary step since it can be proved if there is a common inhomogeneity in standard deviation of daily data then we have the same inhomogeneity in the monthly mean data. Moreover some real examples and homogenization results will be also presented to illustrate this problem.

An automatic algorithm was also developed at this new version in order to make the homogenization easier for the users.