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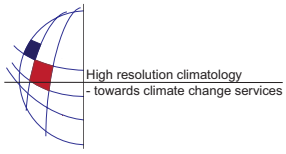

Development of a homogeneous long monthly precipitation dataset for Spain

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The reconstruction of a single long time series from a number of shorter series belonging to nearby observatories enables the optimization of fragmented precipitation data sets. The reconstruction is based on the hypothesis that the cessation of data recording at one observatory is followed by the establishment of one new observatory very close to the closed one (in many occasions, just in-town relocations). To maintain them as two independent series is not useful for climate analysis because of their short length. If the observatories are very close, the differences in monthly precipitation amounts are usually very small and data from two or more series can be combined in order to form a very long record series. This series is attributed to the last observatory that is now a days working and will be probably working in the future. Logically, the resulting combined series can exhibit inhomogeneities which must be identified and removed from further analyses. In this study, we present the compilation of a dataset integrated by 66 long monthly precipitation series, which covers mainland Spain and the Balearic Islands. In order to detect, and adjust for, possible multiple change points or shifts that could exist in the precipitation series, the penalized maximal F test is used. This test allows the time series being tested to have a linear trend throughout the whole period of the data record, with the annual cycle, linear trend, and lag-1 autocorrelation of the base series being estimated through iterative procedures while accounting for all the identified mean-shifts. Once the Type-1 change points have been identified, they are compared with the information contained in metadata and the significance and then the magnitude of the change points retained as suspicious are assessed. Furthermore, to assess the importance of network density to the detection and correction of inhomogeneities, the previous homogenization procedure has been compared with the results of an application of the R package Climatol to the homogenization of the 2722 stations with a minimum of 30 years with data in the period 1920-2009. The results of both homogenization processes are analyzed, and their discrepancies discussed.