

Evaluation and comparison of two downscaling methods for daily precipitation in hydrological impact studies

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Abstract This paper aims to evaluate and compare two downscaling methods for daily precipitation over the Ebro catchment in Spain (85 000 km²). The two downscaling methods are probabilistic and assume that the change in precipitation simulated by the climate model can be transferred to the distribution of the precipitation at the local scale. The first method is the perturbation method and serves as the benchmark against which CDF-t, a recently proposed downscaling method, is compared. The local data consist of 10 km × 10 km grids of daily precipitation over the Ebro catchment. The large-scale data are outputs from two GCMs (ECHAM5 and CNRM-CM3) of the ENSEMBLES project under the baseline scenario for the 20th century. According to the availability of data, we defined a reference period over the years 1959–1978 and a study period over 1979–1998. Several variants of each downscaling method were compared on the study period. We designed three performance criteria which relate to important features of precipitation for hydrological modelling (similarity in distribution, seasonality and total precipitation). We provide an overview of the performance of the best variant of each downscaling method with both GCMs.

Key words global climate models; perturbation method; CDF-t; Ebro catchment, Spain; impact studies; K-S statistic