Statistical downscaling for winter streamflow in Douro River

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In this paper we have obtained climate change projections for winter flow of the Douro River in the period 2071-2100 by applying the technique of Partial Regression and various General Circulation Models of CMIP5.

The streamflow data base used has been provided by the Center for Studies and Experimentation of Public Works, CEDEX. Series from gauing stations and reservoirs with less than 10% of missing data (filled by regression with well correlated neighboring stations) have been considered. The homogeneity of these series has been evaluated through the Pettit test and degree of human alteration by the Common Area Index. The application of these criteria led to the selection of 42 streamflow time series homogeneously distributed over the basin, covering the period 1951-2011. For these streamflow data, winter seasonal values were obtained by averaging the monthly values from January to March.

Statistical downscaling models for the streamflow have been fitted using as predictors the main atmospheric modes of variability over the North Atlantic region. These modes have been obtained using winter sea level pressure data of the NCEP reanalysis, averaged for the months from December to February. Period 1951-1995 was used for calibration, while 1996-2011 period was used in validating the adjusted models.

In general, these models are able to reproduce about 70% of the variability of the winter streamflow of the Douro River.

Finally, the obtained statistical models have been applied to obtain projections for 2071-2100 period, using outputs from different CMIP5 models under the RPC8.5 scenario. The results for the end of the century show modest declines of winter streamflow in this river for most of the models.

Keywords: Statistical downscaling, streamflow, Douro River, climate change.