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Forecasting precipitations for hydroelectric power management : how can an “end user” exploit seasonal forecasts ?

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The EDF group is the biggest French electric power producer and distributor. Its activities are highly related to meteorological and climate conditions. In particular, an optimal management of the hydroelectric power production system implies a good forecast of the water resources that will be available in the future, a few days to several months ahead. Seasonal forecasts are thus an important field of investigation, as they would allow a better water management than climatologic data do, if they are more skilful than those ones. However, two main problems are to be faced : firstly, direct precipitation forecasts at this timescale have almost no skill over Europe, and secondly, space and time scales of seasonal forecast models are not adequate to predict local precipitations at the river basins scale. We so have to use downscaling techniques to optimally exploit the moderate skill of large scale fields (e.g. geopotential height) to make local precipitations forecasts.

The main goal of this work is to evaluate the quality of the quantitative seasonal forecasts of local precipitations on 48 catchments in southern France. These are obtained by spatially downscaling the large scale seasonal forecasts of geopotential height at 850 hPa. The statistical method proposed is based on a Singular Value Decomposition (SVD) plus a multilinear regression. The study is done in two steps. First, the statistical relationship between the local and the global variables is calculated from historical and reanalysis data. We use 45 years of precipitation observations on the concerned basins and watersheds and of ERA40 reanalysis global fields. In a second step, the statistical model obtained is applied to the seasonal hindcasts issued from the DEMETER project: 7 ensemble models (of 9 members each) for seasonal forecasting are available over a period of about 20 years (1981-2001).

This study allows us first to determine if it is possible to obtain a useful and valuable information for EDF needs (in terms of the errors, correlations, etc) at the local scale, from a climate information averaged over a month or a season. Second, we test the proposed statistical downscaling model in a forecasting mode and from a multi-model point of view, as different forecasting models of the DEMETER project are available.