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On the interest of combining an analog model to a regression model for the adaptation of the downscaling link. Application to probabilistic prediction of precipitation over France.

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Scenarios of surface weather required for the impact studies have to be unbiased and adapted to the space and time scales of the considered hydro-systems. Hence, surface weather scenarios obtained from global climate models and/or numerical weather prediction models are not really appropriated. Outputs of these models have to be post-processed, which is often carried out thanks to Statistical Downscaling Methods (SDMs).

Among those SDMs, approaches based on regression are often applied. For a given station, a regression link can be established between a set of large scale atmospheric predictors and the surface weather variable. These links are then used for the prediction of the latter. However, physical processes generating surface weather vary in time. This is well known for precipitation for instance. The most relevant predictors and the regression link are also likely to vary in time. A better prediction skill is thus classically obtained with a seasonal stratification of the data. Another strategy is to identify the most relevant predictor set and establish the regression link from dates that are similar – or analog – to the target date. In practice, these dates can be selected thanks to an analog model.

In this study, we explore the possibility of improving the local performance of an analog model – where the analogy is applied to the geopotential heights 1000 and 500 hPa – using additional local scale predictors for the probabilistic prediction of the Safran precipitation over France. For each prediction day, the prediction is obtained from two GLM regression models – for both the occurrence and the quantity of precipitation – for which predictors and parameters are estimated from the analog dates.

Firstly, the resulting combined model noticeably allows increasing the prediction performance by adapting the downscaling link for each prediction day. Secondly, the selected predictors for a given prediction depend on the large scale situation and on the considered region. Finally, even with such an adaptive predictor identification, the downscaling link appears to be robust: for a same prediction day, predictors selected for different locations of a given region are similar and the regression parameters are consistent within the region of interest.