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Extension of a fine mesh reanalysis over France on the entire XXieth century : Feasibility and prospects

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The SAFRAN-ISBA-MODCOU (SIM) system is a combination of three different components: an atmospheric analysis system (SAFRAN) providing the atmospheric forcing for a land surface model (ISBA) that computes surface water and energy budgets and a hydrological model (MODCOU) that provides river flows and level of several aquifers. All these variables generated by the SIM system constitute the SIM reanalysis.

The aim of this work is the extension of the current fine-mesh SIM reanalysis (8 km mesh - 1958-present) to the entire 20th century, especially focusing on temperature and rainfall over France, but also soil wetness and river flows. Such an extension is of particular importance for the development of decadal forecasts and the knowledge of the impact of the muti-decadal variability over France, especially on the water resources and related parameters. In order to realize such extension and to reconstruct the atmospheric variables before 1958, a combination of two approaches is considered: the use of available atmospheric observations over the past decades and a statistical downscaling algorithm to overcome the lack of observations. As statistical downscaling approach, the DSCLIM software package implemented by the CERFACS and using a weather typing based statistical methodology is used. As observations, observed data (rainfall, snow, wind, temperature, humidity, cloudiness) from Météo-France over the past decades are considered. The large scale signal necessary to both approaches is provided by the NOAA 20CR reanalysis.

After the presentation of the strengths and weaknesses of the two approaches in terms of their bias and correlation on different time scales against the current reanalysis, a method combining the statistical downscaling and the available observation will be presented.

The final results are encouraging in terms of mean state, correlation from daily up to multi annual scales. The precipitation long term variation are mostly consistent with long time series available over France. For the River Flow reconstruction, the reanalysis will be very likely helpful for climate studies and show already consistency with the current SIM reanalysis. However, it will not be of interest for individual event studies in relationship with the performance of the methods used for the reconstructed atmospheric parameters. Finally some prospects in terms of improvement will be pointed out.