

## Extension of the Safran-Isba-Modcou hydrometeorological reanalysis on the entire 20th century

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The 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 current version only covers the 1958-2008 period.

The aim of this work is the extension of the SIM reanalysis (especially temperature and rainfall over France, but also soil wetness and the river flows) on the entire 20th century (ideally from 1871 ). This extension will first allow a detailed investigation of the influence of decadal variability on France temperature and precipitation at very fine spatial scales. It provides a crucial information for climate model evaluation at local scales and for the study of the past decadal climate variability of both near surface atmospheric parameters and water resources over France. It will be also used to design and improve downscaling method over largely extended calibration and verification periods. One important objective will also be to isolate the contribution of natural decadal variability from that of anthropogenic forcing to climate variations.

To realize such extension, a combination of two approaches is considered. The available observations over the past decades and a statistical downscaling algorithm are used, in order to reconstruct the atmospheric variables (rainfall, snow, wind, temperature, humidity, cloudiness) necessary to force the SIM chain and then to obtain the hydrological variables. First, the bias introduced in the SIM reanalysis by the decrease of the number of available observations before 1958 is estimated. SIM experiments are performed, with a number of observations artificially reduced to one similar to 1910-1930-1950. These biases are compared to those of the DSCLIM method (a statistical downscaling method implemented by the CERFACS). The DSCLIM algorithm is then applied to the entire century, using the NOAA20CR reanalysis as large scale predictor. Its ability to reconstruct surface atmospheric variables over past decades are compared to observations. Finally, a method using the statistical downscaling approach combined to the available observations is discussed.