



## Validation of the SAFRAN meteorological analysis system in the northeast of Spain

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To reliably simulate the continental water balance by means of a land-surface model, it is necessary to have a good quality gridded dataset of screen-level meteorological variables. SAFRAN (Quintana-Seguí et al. 2008 and Vidal et al. 2010) is an atmospheric analysis system, which is based on optimal interpolation over climatically homogeneous zones (areas where spatial gradients of meteorological variables are not very relevant) and is able to reliably take vertical variations into account. SAFRAN is currently operational at Météo-France, as part of the SIM hydrometeorological suite (Habets et al. 2008).

SAFRAN was implemented and validated in Northeastern Spain and compared to a similar system, SPAN, which was developed by AEMET, the Spanish Meteorological Service, as part of its contribution to the scientific plans of the NWP European Consortium HIRLAM. SPAN is the surface analysis of the HIRLAM Analysis and Forecasting System, running operationally at AEMET and the rest of HIRLAM countries.

This work belongs to our effort to build a distributed hydrological model for this area, similar to SIM (Habets et al., 2008). SAFRAN was implemented and validated using AEMET's current operational meteorological model (HIRLAM-HNR, 5 km of resolution) and data from its climatological and synoptic databases. SAFRAN analyses data every six hours and produces a database over a regular grid of 5km of spatial resolution and at the hourly time step. The period studied covers one year (Sept 2009 - Aug 2010).

Firstly it was necessary to test different sets of climatically homogeneous zones. The first set consists on the meteorological alert zones of AEMET. The second one is the European river catchments dataset (ERC), from the European Environmental Agency. We found that, for most variables, the performance is similar using both sets of zones.

For all the tested variables (temperature, wind speed, relative humidity and precipitation), SAFRAN and SPAN are able to correctly reproduce the daily and the annual cycle, being SAFRAN's performance slightly better for all measures and variables, with one exception: it has a systematic bias of wind speed, which is very constant, and which is also present in the French version of the system. Both SAFRAN and SPAN produce similar spatial patterns, but there are some differences in very specific areas and seasons, mainly on the relief. In fact, it is in mountain areas where both systems have more problems.

The implementation of SAFRAN on this area will allow a number of future studies, which include the study of the hydrological cycle, by means of a land-surface model, and the use of SAFRAN as an observational database for statistical downscaling of climate scenarios. These studies will be performed under the umbrella of the HyMeX program (<http://www.hymex.org>), which is studying the water cycle in the Mediterranean basin, and the SMOSCat project (<http://www.isardsat.cat/en/smoscat.html>), which plans to downscale SMOS soil-moisture data to a resolution of 1 km, the land-surface model will help in validating the new soil moisture dataset.