Simulation of drought processes in Spain

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Introduction

The recently started FP7 project **eartH2Observe**, aims at integrating available global earth observations, in-situ datasets and models to conduct a global water resources re-analysis dataset of significant length.

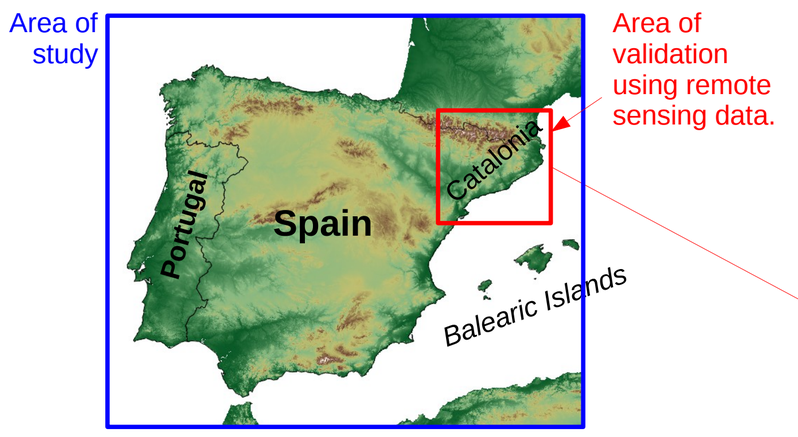
The usability and operational value of the developed data will be verified and demonstrated in a number of **case-studies** across the world.

The work presented in this study corresponds to the **Spanish case study**. In the Spanish case study, we are focused on the reproduction of **drought conditions** with two different land surface models.

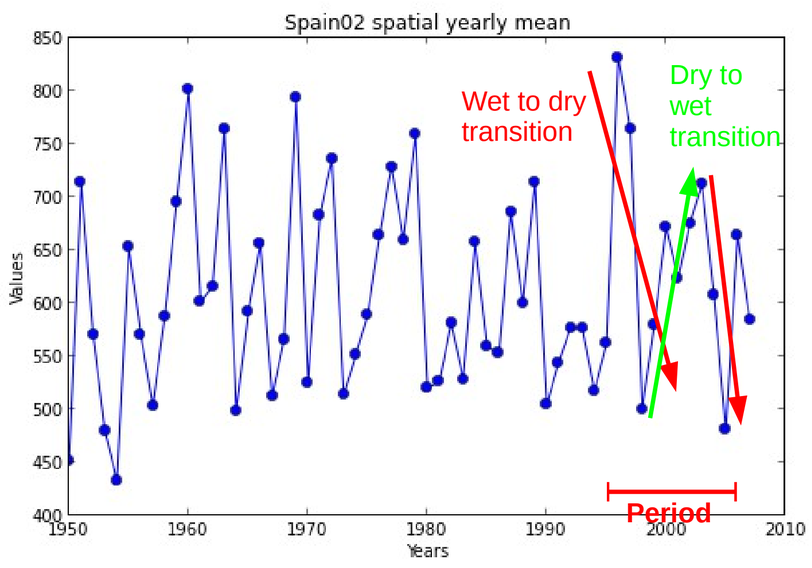
In this poster we present the first steps in this case study using the SURFEX LSM.

Area and period of study

Our are of study covers mainland Spain and the Balearic islands. The LSM has been compared to remoted sensing data in Catalonia (NE) Spain.

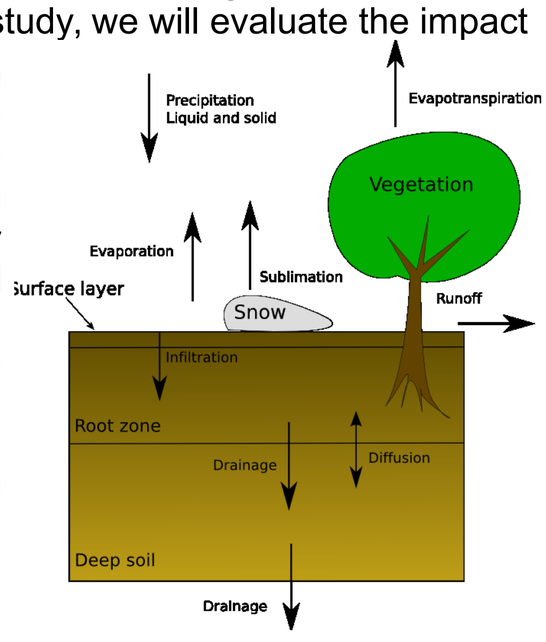


We have selected a 12 year period (1/9/1995 - 31/8/2007) that covers a transition from wet to dry conditions. This period has been selected based on the behaviour of the Spain02 gridded dataset of precipitation.



Land Surface Model

We are using the ISBA-3L scheme, integrated within SURFEX. We run it at a resolution of 5 km, forced by the SAFRAN analysis system. One of its limitations, for our study, is the lack of underground water in the model. In the case study, we will evaluate the impact of such limitation by comparing it to the LEAF-HYDRO LSM, which has an underground water scheme. We will also consider the inclusion of the LEAF-HYDRO underground scheme in SURFEX.



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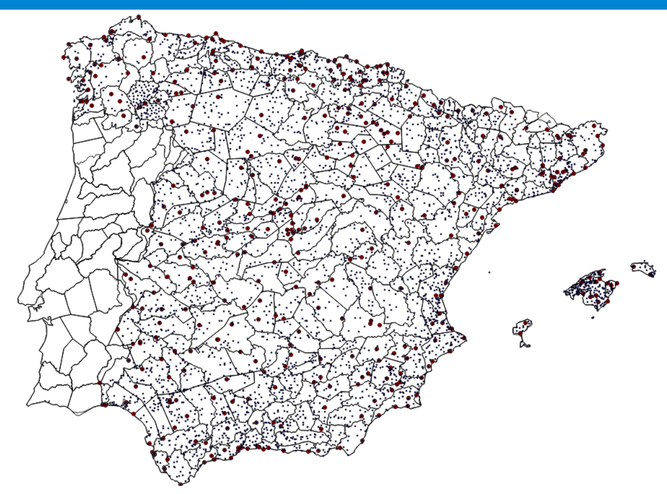
Meteorological forcing: high resolution dataset.

Our high resolutin dataset is based on **SAFRAN**, which is based on optimal interpolation over climatically homogeneous zones. SAFRAN combines a first guess (ERA-Interim) with all available observations.

SAFRAN analyses temperature, precipitation, wind speed, relative humidity and cloudiness it also simulates downward radiation.

In Spain SAFRAN was implemented on the Ebro River basin. **We are now extending it to the the whole area of study**. We created new climatically homogeneous zones for Iberia and the Balearics , based mainly on river basins but also on our expert knowledge of the climate of the area.

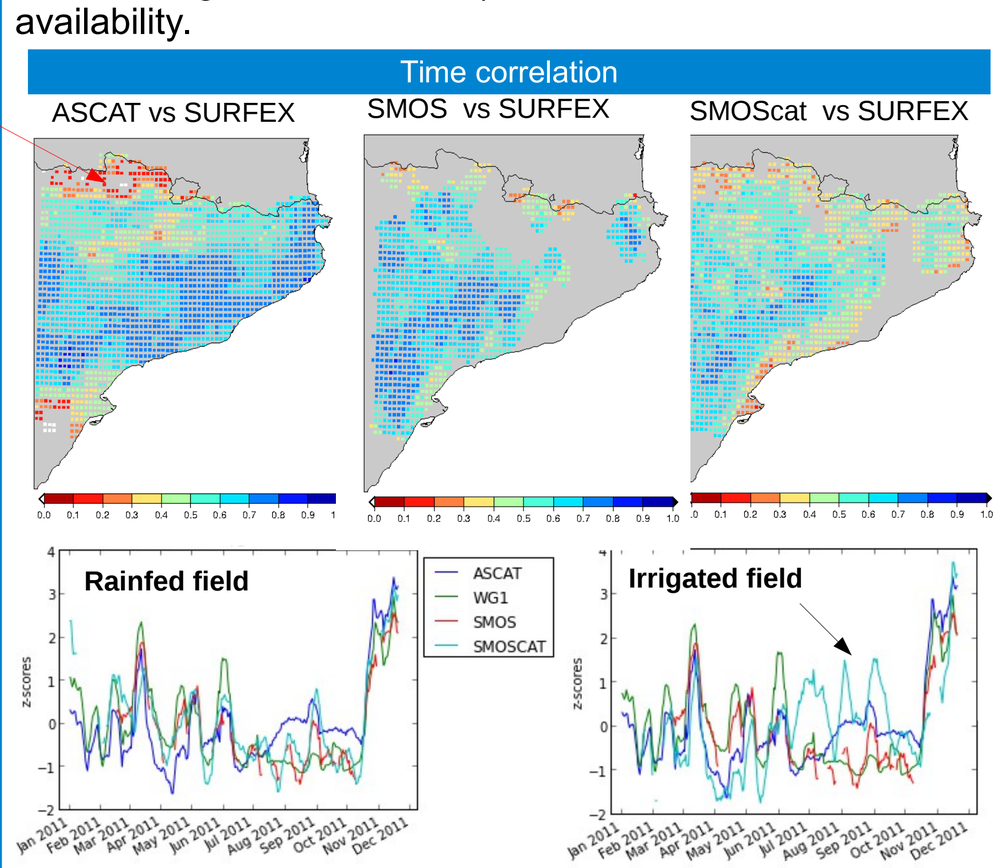


- The black lines correspond to the borders of the zones.
- The black dots correspond to the available precipitation stations.
- The red dots to the available temperature stations.

The resulting gridded dataset will have a resolution of 5 km. Currently, there is no equivalent dataset in the area.

Validation of the SURFEX simulated soil moisture

As a first step in our study, we have validated the performance of the SURFEX LSM to simulate soil moisture. We compared simulated superficial SM (WG1) to remote sensing based SM products: ASCAT and SMOS (low resolution) and SMOScat (high resolution downscaling of SMOS, 1km). This validation has been done in Catalonia, due to data availability.



- The low resolution products (~40 km) show better correlation on more points as they limit the effect of small scale features such as irrigation.
- Correlation with SMOS and SMOScat is better in flat, non irrigated areas which are not close to the sea.
- There are high discrepancies on the relief.
- Validation of soil moisture is still a challenge, due to the lack of in-situ observations.

Conclusions and perspectives

The extension of SAFRAN, which is in course, will open many possibilities in Spain for land-surface modelers It will also be very useful for the validation of RCMs.

The extension of SURFEX to Spain will allow a better comprehension of the continental water cycle, in general, and droughts in particular. Its validation is not simple, but the use of remote sensed data is promising. We intend to extend the validation to the whole area of study. Within the project, we will also couple SURFEX to the RAPID routing scheme in order to simulate river flows. Due to the high degree human influence in the Spanish basins we intend to, at least, simulate the effect of the larger dams. In the future we may also work on the inclusion of irrigation and underground water into the LSM. Remote sensing data will help us determine the areas where irrigation has an impact.

The comparison of SURFEX and LEAF-HYDRO will help us improve both LSMs and better learn the effects of underground water in drought processes in Spain within the eartH2Observe project.

References

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