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Using remote sensing data and land-surface models to understand and monitor drought in Iberia within the HUMID project.

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Drought is a major climatic risk resulting from complex interactions between the atmosphere, the continental surface and water resource management. Droughts have large socioeconomic impacts in Spain and recent studies show that drought is increasing in frequency and is more severe. Climate change will put even more pressure on water resources.

Currently, in Spain, drought is being monitored by basin agencies using indices calculated from observed variables. The main indicators used are SPI (meteorological agencies), dam levels and/or piezometry. These indices were chosen to respond to the specific needs of these agencies, but do not provide a complete picture of the system and do not serve some kinds of users that are not served by these agencies.

A meeting with stakeholders has surfaced that the main concern of the invited agents is the scarcity of water resources in the medium and long term, not drought itself. Concerning drought, the stakeholders are very interested in the impacts of drought on different ecosystems (forests, continental aquatic ecosystems, etc.) and are also interested in how afforestation affects the water balance and drought. Finally, there is demand for a more complete information about the state of the drought, that goes beyond currently used indices and that is well adapted to the local Mediterranean and semi-arid climates.

In response to these needs, HUMID is working on land-surface model and remote sensing based drought products.

To this end, the project has been evaluating how LSM simulate drought and its propagation from precipitation to soil moisture and stream flow, showing high uncertainty, specially in soil moisture. It has also been analyzing if RCMs improve the drought signal provided by ERA-Interim showing that RCMs provide value in terms of precipitation drought, but not in terms of soil moisture and stream flow drought. The project is also aiming at improving the SASER land-surface model based hydrological model in order ton include dams, with the objective to simulate anthropic impacts on drought.

On the remote sensing front, the project is producing 1 km resolution SMOS (more than 9 years of data are available) and SMAP surface soil moisture data downscaled using the DISPATCH algorithm, which is being used to calculate soil moisture drought indices. The project has also been exploring if these data can be used to quantify irrigation in the basin and analyzing if satellite altimetry data can provide useful information on dam levels that can be used to force hydrological models.

Later on the project will work on how EO and LSM data can be successfully combined to improve our understanding and monitoring of drought in a Mediterranean and semi-arid context; analyze the impact of anthropic processes on drought propagation; and study the role of vegetation on drought propagation in our area of study.