

irrigated areas using satellite images developed by research institutes (TETIS, CESBIO) in several pilot areas of the Durance catchment basin in order to evaluate their application on a larger scale.

Description

the territory.

The databases currently available do not provide a reliable estimate of the surfaces irrigated by water from the Durance. The use of satellite images opens up the possibility of obtaining up-to-date, spatialised information on the crops irrigated in the Durance basin.

As part of the Durance SAGE, the SMAVD has initiated a watershed modelling project called C3PO. The data produced as part of this project is an essential input to this tool for estimating current and future irrigation needs and characterising the interactions (flows) between irrigation, the water table and the river. In this way, water sharing can be discussed by examining the potential impact of changes in hydrology on water availability, as well as the impact of changes in practices and uses.

Methodology

anticipating the future demand for water

resources, depending on the development of

This experiment benefited from a partnership with the Regional Chamber of Agriculture and the Chambers of Agriculture of Bouches-du-Rhône, Alpes de and Haute-Provence Hautes able Alpes, who were to contribute their local expertise to the project.

3 methods were tested using freely available Sentinel-1 (radar) and Sentinel-2 (optical) satellite images as input data. 3 Following types of mapping have been carried out for 2021 and 2022: soil moisture, crop moisture and irrigation moisture.

Depending on the methodology, the experiment used information from the RPG and field surveys. + 2000 points collected in 2021. This data is a key factor in the success of the maps, so particular attention must be paid to exploiting it.



The aim is to map all the crops grown in the Durance catchment area and to distinguish between those that are irrigated, in order to calculate the surface area occupied by the various irrigated crops.



The results obtained constitute a set of reference data on crops and irrigation within the framework of the Durance SAGE. They have been integrated into the C3PO tool to improve the estimation of water requirements.

This work has shown the importance of having a database of the contours of agricultural parcels (work in progress). The lack of such a database is an obvious obstacle to the use of these methods.





contact@smavd.org

https://www.gesteau.fr/lifeeau-climat/resultats

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Results

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Soil moisture mapping (TETIS method)

Soil moisture mapping is a set of processes that use radar imagery to determine the moisture content of the top centimetres of soil.



This mapping is applied to big crops and grassland.



It does not include tree crops.

The results cannot be used directly to map irrigation, as variations in humidity depend not only on irrigation but also on the meteorological context.



Irrigation mapping (TETIS S2IM method)

This method uses optical and radar satellite images and the RPG as input data. It does not require any field data.



The irrigation mapping approach is applied to field crop and grassland RPG plots.



Shrub crops are excluded. Mapping on RPG plots excludes shrub crops (orchards, vines). It is therefore incomplete, which is its main limitation.



The overall accuracy of irrigation mapping in the pilot areas varies between 60% and 92% for the TETIS method.



Irrigation mapping (CESBIO lota-2 method)

This second irrigation mapping method uses optical and radar images and requires in-situ data for the agricultural period under study.



The difficulties encountered in differentiating between shrub crops (orchards, vines, olive groves) and forests have been overcome by incorporating shape and texture cues.

The results are available as a raster (pixelated image) over the whole basin, for all crops.



The limitations of this crop mapping methodology lie in the need to obtain in-situ data.



The overall accuracy of irrigation mapping in the pilot areas varies between 74% and 92% for the CESBIO method.

RESULTS

The maps produced are used to update the input data for the Durance basin model (C3PO): irrigated areas by type of crop. This required a considerable amount of post-processing of the raw raster maps in order to calculate realistic irrigated areas.

The results of the experiment are positive: the methods have been validated in the Durance basin and now make it possible to envisage annual monitoring of irrigated areas on a large scale.



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