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EO-based predictive differential irrigation scheduling a week ahead

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The experiences gathered during the past 3 decades support the operational use of earth observation-based methodologies for the advice of crop irrigation. The availability of Sentinel 2 constellation in combination with Landsat 8 provides an unseen temporal and spatial resolutions, with more than 1 image per week and pixel areas up to 100 m2. These images exhibit exciting potentialities and this work describes their application in the advice or predictive differential irrigation scheduling, providing maps of water requirements for the coming week and at pixel scale. However, prior to the operational implementation of these methodologies some conceptual topics and operational issues must be responded and solved.

According to the scientific consensus, the time series of multi-spectral image provide information to estimate the crop evapotranspiration (ETc) in absence of biotic or abiotic stresses. In the other side, the end-users, i.e. professional farmers or decision-makers, are interested in the estimation of net irrigation water requirements (NIWR). NIWR is the water that must be supplied by irrigation to satisfy the ETc, leaching and miscellaneous water consumption that is not supplied by the water stored or the precipitation that enters in the soil. Therefore, calculation of NIWR requires implementation of a soil water balance where ETc is the main component. However, under determinate conditions the contribution of the water stored in the soil versus the seasonal water use can be neglected, the water leaching is limited to the rainy periods and the run-off is restricted to small areas. Under these premises, NIWR can be approached by the difference of ETc minus precipitation, and the EO-based ETc approaches can be directly used for irrigation advice.

The experiences described in this work reflect the ongoing applications of these methodologies in real-world scenarios, providing advice in areas with extensive experience in irrigated agriculture. The ETc predicted for the next week is translated to the end-users in the desired format, once per week and with the adequate spatial resolution. The maps of ETc allow the implementation of differential irrigation in some cases, and the knowledge of the differences in ETc can be used to optimize the irrigation doses. This information is greatly appreciated by the end-users and this document analyzes some commercial services based on the methodologies described.