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## Combining the FAO56 agrohydrological model and remote sensing data to assess water demand in a Sicilian irrigation district

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Agricultural water use in irrigated areas plays a key role in the Mediterranean regions characterized by semi-arid climate and water shortage. In the face of optimizing irrigation water use, farmers must revise their irrigation practices to increase the drought resilience of agricultural systems and to avoid severe damages in agro-ecosystems. In this direction, during the last decades, the research has been focused on mathematical models to simulate the process of driving mass transport and energy exchanges in the Soil-Plant-Atmosphere system.

The objective of the paper was to test the suitability of the combination of FAO56 agrohydrological model with remote sensing data retrieved from the Moderate Resolution Imaging Spectroradiometer (MODIS) platform, to assess the spatiotemporal distributions of crop water requirement and to schedule irrigation in an irrigation district of the south-west of Sicily, Italy.

The proposed approach allowed obtaining the spatiotemporal distributions of soil and crop parameters used in the FAO56 model implemented in a GIS environment to simulate the water balance, as well as to assess the actual irrigation strategy. The GIS database was organized to include soil and crop parameters, as well as the irrigation volumes actually delivered to each farmer; the latter data can be used not only as input for water balance to evaluate the efficiency of the actual irrigation strategies but also to identify different irrigation scheduling scenario obtained by the FAO56 procedure.

The first application was carried out for the period 2014-2017, to identify a combination of irrigation scheduling parameters to be implemented in the model aimed at reproducing the ordinary strategy adopted by the farmers, based on the spatiotemporal variability of soil and climate forcings. When the model outputs were aggregated for single crop types, a fairly good agreement was found between simulated and actual seasonal irrigation volumes delivered either at the level of district and secondary units. Alternative scenarios of irrigation water distribution were then identified and analyzed, to provide irrigation technicians and policymakers a decision support tool to improve the efficiency of irrigation systems and to optimize the distribution based on the availability of water resources.