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Influence of irrigation on soil moisture and evaporation based on Sentinel 1 backscatter observations and an evaporation retrieval model

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Irrigation stands out as a primary driver influencing water dynamics over agricultural regions. Its estimation in time and space is complex, and satellite observations are only indirectly related to irrigation. Conveniently, Sentinel 1 SAR observations are sensitive soil moisture dynamics and irrigation, and can be used to estimate these dynamics at high resolution. The influence of irrigation on transpiration is however even more complicated to unravel from space observations. Current evaporation retrieval models are not designed to represent the influence of irrigation. However, the current availability of Sentinel 1 observations represents an opportunity to fill this gap.

In this presentation, the Global Land Evaporation Amsterdam Model (GLEAM) will be adapted to assimilate Sentinel 1 backscatter, using the Ebro river basin in Spain as a study case. While GLEAM's coarse resolution has to date hindered its application in the context of agricultural management, recent efforts during the Digital Twin Earth ESA initiative have yielded a GLEAM version at 1km resolution over the Mediterranean region that will be used in the context of this study. Here, we aim to leverage the high-resolution (1-km) GLEAM and explore its coupling to the Water Cloud Model to enable the forward data assimilation of Sentinel 1 backscatter. Several data assimilation techniques, such as Ensemble Kalman Filter, will be applied, seeking to find a method to estimate evaporation and soil moisture in irrigated land that can be transferable to basins where irrigation volumes are not available.