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An experimental framework for the integration of remote sensing, ground data and models to monitor vegetation water stress

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Water planning in complex landscapes requires integration models and data from different sources at a variety of spatial and temporal resolutions. In this work an experimental framework composed of sensors measuring diverse source areas, heights and time-steps were installed in an area selected to allow the spatial combination of these measurements with remote sensors comprised of a range of resolutions (10-103 m pixel size; daily to monthly data acquisition). This system includes among others, soil moisture and micrometeorological instruments, surface run-off data at the output of the watershed, phenology monitoring digital camera, punctual surface radiometric temperature and vegetation properties, providing measurements of important components of the water and surface energy balances representing the area, and supporting the implementation and validation of hydrological models to provide insights about the vegetation water status and its role in the hydrology of the system.

The selected ecosystem is an oak savanna, a widespread agroforest in Southern Europe ($\approx$ 3 million ha) recognized as an example of sustainable land use and for its importance in rural economy. It is composed of widely-spaced Quercus trees combined with crops, pasture and shrubs in the sub-canopy region. Water stress is one of the diagnosed causes of current tree decline, an important threat for the conservation of the system. The system design and setup is presented and discussed, along with the spatial and temporal scales linkages of data and processes.