Assessing daily ERA5-Land reanalysis data to estimate olive orchards actual evapotranspiration in Sicily

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**Abstract.** Accurate estimations of actual crop evapotranspiration obtained with agro-hydrologic models are of utmost importance to evaluate crop water requirements and optimize water use efficiency.

The objective of this work was to assess the suitability of ERA-5 Land reanalysis data to estimate actual evapotranspiration (ETa) of an olive orchard (cv. "Nocellara del Belice") located in the southwest of Sicily, Italy. After examining the errors associated with each climate variable deduced from the ERA5-Land product and verifying the reliability of the FAO-56 model, the comparison between the ETa values predicted by introducing the reanalysis data in model simulation and the corresponding measured on the ground was carried out.

Experiments were implemented during three irrigation seasons (2009-2011) in an orchard extended about 13 ha and characterized by trees having a height of about 3.5 m and spaced 5 m × 8 m. An Eddy Covariance tower (EC) was installed in the orchard to measure, at a sub-hourly time step, air temperature and relative air humidity, wind speed and direction, net solar radiation and, finally, sensible and latent heat fluxes. A meteorological station of the Sicilian Agrometeorological Information Service (SIAS) to monitor the climatic variables used to estimate crop reference evapotranspiration was also installed about 500 m apart from the study area. The hourly values of reanalysis climatic variables, including rainfall, were finally deduced from the ERA5-Land product, characterized by a spatial resolution of about 9 km.

For the three examined seasons application of the FAO-56 model with climate data measured on the ground produced fairly good estimations of ETa, with values of root mean square error (RMSE) ranging between 0.40 and 0.69 mm/d and mean bias error (MBE) from -0.24 to 0.10 mm/d. Similar results were obtained when model simulations included the ERA-5 Land data, whose results indicated values of RMSE and MBE respectively in the range 0.46÷0.65 and -0.13÷0.07 mm/d.