Evapotranspiration and crop coefficients for a super intensive olive orchard. An application of SIMDualKc and METRIC models using ground and satellite observations

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Abstract: The estimation of crop evapotranspiration (ETc) from the reference evapotranspiration (ETo) and a standard crop coefficient (Kc) in olive orchards requires that the latter be adjusted to planting density and height. The use of the dual Kc approach may be the best solution because the basal crop coefficient Kcb represents plant transpiration and the evaporation coefficient reproduces the soil coverage conditions and the frequency of wettings. To support related computations for a super intensive olive orchard, the model SIMDualKc was adopted because it uses the dual Kc approach. In alternative, to consider the physical characteristics of the vegetation, the satellite-based surface energy balance model METRICTM - Mapping EvapoTranspiration at high Resolution using Internalized Calibration - was used to estimate ETc and to derive crop coefficients. Both approaches were compared in this study. SIMDualKc model was calibrated and validated using sap-flow measurements of the transpiration for 2011 and 2012. In addition, eddy covariance estimation of ETc was also used. In the current study, METRICTM was applied to Landsat images from 2011 and 2012. Adaptations for incomplete cover woody crops were required to parameterize METRIC. It was observed that ETc obtained from both approaches was similar and that crop coefficients derived from both models showed similar patterns throughout the year. Although the two models use distinct approaches, their results are comparable and they are complementary in spatial and temporal scales.

Key words: Density coefficient, Dual crop coefficients, Eddy covariance, Evapotranspiration partition, Remote sensing, Sap-flow measurements, Woody crops.