

# Performance assessment of the ERA5-Land reanalysis versus ground-based agrometeorological data over a south Mediterranean basin

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## Abstract

Reference evapotranspiration (ET<sub>0</sub>) is a key parameter for assessing crop evapotranspiration (ET<sub>c</sub>). The latter, considered the crop water demand, is a critical component of the water budget and could be responsible for up to 60% of precipitation returns to the atmosphere. A reasonable estimate of ET<sub>0</sub> requires several climatic data, which may be lacking in areas where monitoring stations are sparse. In semi-arid and arid regions, especially the south Mediterranean, agro-meteorological ground stations are often unavailable and/or sparsely distributed with short datasets, making it difficult to have an overall proper assessment of agricultural water requirements. To overcome this challenge, the use of satellites and the reanalysis datasets could be an alternative to meet the needs for geographically and temporally distributed agro-meteorological data. In this regard, the present study explores the performance of the Penman-Monteith (FAO56-ET<sub>0</sub>) method fed by ERA5 Land outputs in estimating daily ET<sub>0</sub>. First, the ERA5-L data relative to air temperature (T<sub>2m</sub>), surface solar radiation downwards (R<sub>s</sub>), relative humidity (RH), wind speed (u<sub>10</sub>), and reference evapotranspiration (ET<sub>0</sub>) were compared with the corresponding in situ data on a daily basis. Overall, there was a good agreement between observed and reanalysis data. The temperature showed the best performance followed by RH, R<sub>s</sub>, then u<sub>10</sub>. This was translated to good results in ET<sub>0</sub> estimation under different topographical conditions. The results revealed the potential of reanalysis datasets as an alternative input for estimating ET<sub>0</sub> and overcoming the unavailability of certain agrometeorological data.

**Keywords:** ERA5-Land, Reanalysis, Meteorological data, Reference evapotranspiration, Data-scarce regions.