Geophysical Research Abstracts
Vol. 16, EGU2014-10903, 2014
EGU General Assembly 2014

Evaluating the performance of reference evapotranspiration equations with scintillometer measurements under Mediterranean climate and effects on olive grove actual evapotranspiration estimated with FAO-56 water balance model

Mario Minacapilli (1), Carmelo Cammalleri (2), Giuseppe Ciraolo (3), Giuseppe Provenzano (1), and Giovanni Rallo (1)

(1) Department of Agricultural & Forestry Science (DSAF), Università degli Studi di Palermo, Italy, (mario.minacapilli@unipa.it), (2) European Commission, Joint Research Centre, Institute for Environment and Sustainability, Ispra (VA), Italy, (cammillino@gmail.com), (3) Department of Civil, Environmental, Aerospace, Materials Engineering (DICAM), Università degli Studi di Palermo, Italy, (giuseppe.ciraolo@unipa.it)

The concept of reference evapotranspiration (ETo) is widely used to support water resource management in agriculture and for irrigation scheduling, especially under arid and semi-arid conditions. The Penman-Monteith standardized formulations, as suggested by ASCE and FAO-56 papers, are generally applied for accurate estimations of ETo, at hourly and daily scale. When detailed meteorological information are not available, several alternative and simplified equations, using a limited number of variables, have been proposed (Blaney-Criddle, Hargreaves−Samani, Turc, Makkinen and Pristley-Taylor).
In this paper, scintillometer measurements collected for six month in 2005, on an experimental plot under "reference" conditions, were used to validate different ETo equations at hourly and daily scale. Experimental plot is located in a typical agricultural Mediterranean environment (Sicily, Italy), where olive groves is the dominant crop.
As proved by other researches, the comparison confirmed the best agreement between estimated and measured fluxes corresponds to FAO-56 Penman-Monteith standardized equation, that was characterized by both the lowest average error and the minimum bias. However, the analysis also evidenced a quite good performance of Pristley-Taylor equation, that can be considered as a valid alternative to the more sophisticated Penman−Monteith method.
The different ETo series, obtained by the considered simplified equations, were then used as input in the FAO-56 water balance model, in order to evaluate, for olive groves, the errors on estimated actual evapotranspiration ET. To this aim soil and crop model input parameters were settled by considering previous experimental researches already used to calibrate and validate the FAO-56 water balance model on olive groves, for the same study area.
Also in this case, assuming as the true values of ET those obtained using the water balance coupled with Penman-Monteith ETo input values, the Priestley-Taylor equation, requiring a limited number of input meteorological data, was characterized by the best performance if compared to the other equations used to evaluate ETo. Under environments conditions similar to those considered therefore, according to the good performance associated to the Priestley-Tailor approach, FAO-56 model can allow realistic estimation of ET, even in absence of a full meteorological dataset.