Geophysical Research Abstracts
Vol. 12, EGU2010-9932, 2010
EGU General Assembly 2010

Comparison of four models to calculate canopy resistance of maize in North Italy

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This paper examines four models for estimating canopy resistance r_c, since it is not a purely physiological term, but it depends also on the prevailing climatic conditions get established over the canopy, in order to calculate the actual evapotranspiration on hourly and daily scales, for maize crop grown in North Italy. A comparison between Measured and estimated eddy covariance data was carried out by analysing in details the four models 1) Monteith, 2) Jarvis, 3) Katerji-Perrier, 4) Todorovic. They are either semi-empirical (1, 2 and 3) or mechanistic (4). Furthermore, the FAO approach was also evaluated and compared with the others techniques.

In synthesis, r_c has not been considered as constant but modelled in function of leaf area index through the approach of Monteith and influenced by the photo synthetically active radiation, the vapour pressure deficit, ambient temperature and the soil moisture through the approach of Jarvis. Moreover, r_c has been modelled as a function of the climatic variables and water status condition through the approach of Katerji-Perrier which needs a calibration and finally as a function of only the climatic condition through the approach of Todorovic which does not need any calibration.

The results confirmed the good accuracy of Katerji-Perrier method at both hourly and daily scale, while the approach of Monteith, Jarvis and Todorovic provided an overestimation respectively 12%, 27% and 30%. However, the evaluation of FAO method gave an overestimation and showed that both ET0 and Kc could be sources of errors.

Key words: Canopy resistance, eddy covariance, Monteith, Jarvis, Katerji-Perrier, Todorovic, FAO