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Bulk canopy resistance: Modeling for the estimation of actual evapotranspiration of maize

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Due to the scarcity of water resources, the correct evaluation of water losses by the crops as evapotranspiration (ET) is very important in irrigation management. This work presents a model for estimating actual evapotranspiration on hourly and daily scales of maize crop grown in well water condition in the Lombardia Region (North Italy). The maize is a difficult crop to model from the soil-canopy-atmosphere point of view, due to its very complex architecture and big height.

The present ET model is based on the Penman-Monteith equation using Katerji and Perrier approach for modelling the variable canopy resistance value (rc). In fact rc is a primary factor in the evapotranspiration process and needs to be accurately estimated. Furthermore, ET also has an aerodynamic component, hence it depends on multiple factors such as meteorological variables and crop water condition.

The proposed approach appears through a linear model in which rc depends on climate variables and aerodynamic resistance [rc/ra = f(r*/ra)] where ra is the aerodynamic resistance, function of wind speed and crop height, and r* is called “critical” or “climatic” resistance. Here, under humid climate, the model has been applied with good results at both hourly and daily scales. In this study, the reached good accuracy shows that the model worked well and are clearly more accurate than those obtained by using the more diffuse and known standard FAO 56 method for well watered and stressed crops.