



Prediction of Photosynthetically Active Radiation

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ABSTRACT

In the present study, hourly measurements of solar radiation values in the intervals 295-2800 nm and 695-2800 nm recorded simultaneously, with ultraviolet radiation in the interval 295-385 nm, at the National Observatory of Athens (37° 58' N, 23° 43' E) from January 1990 to December 1996 are used to evaluate predictions of photosynthetically active radiation R_{PAR} , from simple meteorological data and total global radiation measurements. Data obtained during the period 1993-1996 are used for developing predictive relationships of daily and hourly R_{PAR} , based on various parameters as the extraterrestrial solar radiation on a horizontal surface for the PAR spectral range R_{OPAR} , the clearness index for the whole solar spectrum k_T , the dry bulb temperature T , the actual vapour pressure E_O and the daily minimum temperature T_{MIN} , rainfall R and dew point T_D . These relationships are tested on the R_{PAR} measurements taken during the period (1990-1992), reserved as an independent validation set. The results of the linear regression analysis and the 'difference measurements' between predicted and measured R_{PAR} , indicate that a relationship based on R_{OPAR} , k_T , T , and E_O is the best for hourly values (Index of agreement=0.99, R^2 =0.96, MBE=0.88%, RMSE=6.65%). When daily predictions are considered, a linear parameterization based on R_{OPAR} , k_T , T , E_O , R and T_{MIN} give the best results (Index of agreement=0.99, R^2 =0.98, MBE=5%, RMSE=6.27%).