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Thesis Title	*Photosynthetically Active Radiation – PAR and comparison between estimation methods in the region of East Mediterranean*
Supervisor	K. Jacovides, Associate Professor
Summary	The present thesis studies the solar radiation in the Eastern Mediterranean region and aims to contribute to the modeling of the photosynthetic active component of the solar spectrum. The data, which originates from the suburban city of Athallasa in Cyprus, during a ten year period (1998-2007), consists of daily measurements of the global, direct, diffuse, and extraterrestrial components of the solar radiation as well as other meteorological and atmospheric parameters (temperature, dew point, relative humidity, water vapor pressure, clearness index, sky clearness, sky light-brightness, optical mass, precipitable water, solar zenith angle). The relation between *Solar Irradiance* (R_S) and the *Photosynthetic photon flux density* (Q_P) was investigated using two different methods, under various atmospheric conditions: Initially, Artificial Neural Networks Models (ANN) were developed, which showed that the best combination of parameters that give a good prediction of Q_P was that of: (a) R_S, (b) the cosine of the solar zenith angle $cos\theta_z$, and (c) the optical mass m_r, with coefficient determination $R^2 = 0.99$ and *MAPE=3.2%*. Using this best subset selection of variables, a new empirical model is developed for estimating the ratio Q_P/R_S: $Q_P/R_S = -0.00813R_S + 1.61827cos\theta_z + 0.64964m_r$. The model is insensitive to local weather conditions and the estimated Q_P/R_S obtained presents high accuracy. In addition, other empirical regression models like those of Alados et al., Hu et al., Mizoguchi et al., Zhang et al. and Aguiar et al. were applied. All models are evaluated and compared on the basis of the commonly used statistical indices MAPE, RMSE, Max Diff and R^2. The most accurate results were produced by one of the adjusted empirical models (Aguair) (R^2=0.9951, RMSE=1.185 mol/m^2, MAPE=2.922%, Max Diff=3.281mol/m^2)
Key words	Photosynthetically Active Radiation – PAR, Global Solar Radiation, Estimation methods of solar radiation, Artificial Neural Networks, Empirical Models
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