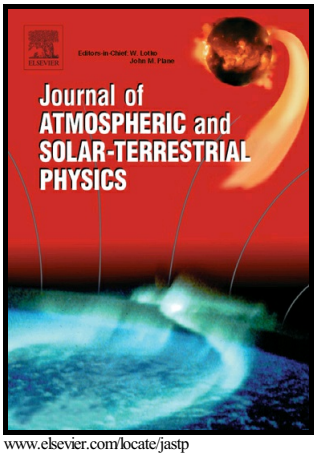

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Performance of the Angstrom-Prescott Model (A-P) and SVM and ANN Techniques to estimate the daily Global Solar Irradiation in Botucatu/SP/Brazil

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ABSTRACT:

This study describes the comparative study of different methods for estimating daily global solar irradiation (H_G): Angstrom-Prescott (A-P) model and two Machine Learning techniques (ML) - Support Vector Machine (SVM) and Artificial Neural Network (ANN). The H_G database was measured from 1996 to 2011 in Botucatu/SP/Brazil. Different combinations of input variables were adopted. Statistical indicatives MBE, RMSE, *d* Willmott, r and R^2 obtained in the validation of A-P and SVM and ANN models showed that: SVM technique has better performance than A-P and ANN models in estimating H_G. The A-P model has better performance than ANN in estimating H_G.

Keywords:

Solar radiation, Angtrom-Prescott, statistical modeling; artificial intelligence, meteorological variables.

1. Introduction

The knowledge of global solar irradiation (H_G) is of fundamental importance in climate studies in the area of renewable energy, architecture projects and agriculture (growth models and productivity of agricultural crops and evapotranspiration estimates) (Souza et al., 2005; Almorox et al., 2005; Hsiao et al., 2008; Yang et al., 2006; Bosch et al., 2008). Brazil is a country of great continental dimensions and has great interest in the knowledge of the annual solarimetric availability for different applications, mainly in projects of power generation and cogeneration. However, Brazil has a tremendous shortage of solarimetric information caused by the high cost and maintenance of solarimetric stations. Therefore, many researchers have been developing and adjusting models that allow estimating the different types of solar radiation such as: global, diffuse, direct and spectral radiation (UV, Photosynthetically Active Radiation - PAR and Near Infrared Radiation - NIR). In general,