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A13A - 06 Poster

AEROSOL OPTICAL THICKNESS INFLUENCE OVER THE PHOTOSYNTHETICALLY ACTIVE RADIATION (PAR) IN EARTH SURFACE - I

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INTRODUCTION

➢During the biomass burning events occur emissions of aerosol particles into the atmosphere. Those particles have an important role by absorbing and reflecting radiation from space, consequently making hotter or colder the earth's surface.

➢A high absorption and scatter of the Photosynthetically Active Radiation (PAR) by biomass burning aerosols make huge influence on the agriculture.

➢ The study were realized at the Southern Regional Space Research's Laboratory of Renewable Energy Resources, in Santa Maria, RS, aiming to evaluate the relationship between aerosols and Photosynthetically Active Radiation (PAR) reaching the Earth's surface on cloudless-sky days through statistical models.

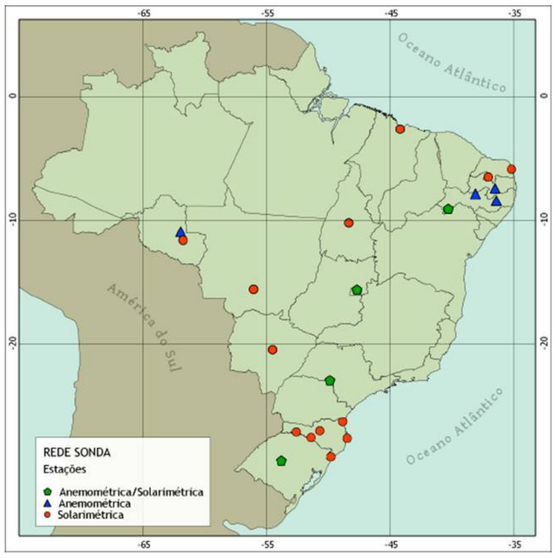

Figure 1 –SONDA Network - sites location throughout the Brazilian Territory and respective types of stations.

➢The SONDA Network (National Organization System Of Environment Data),[1], coordinated by the Center for Earth System Science (CCST/INPE) aims to create a database of solar radiation, wind and other climate data acquired throughout Brazilian territory.

➢The AERONET (AErosol RObotic NETwork),[2], is a network spread all over the world aiming to acquire aerosol properties data coordinated by NASA.

METODOLOGY

➢The PAR radiation data were acquired at the SONDA sites located in Campo Grande - MS, Cuiabá - MT and Petrolina – PE. In addition, data acquired in Alta Floresta - MT were provided by AERONET. Aerosol Optical Thickness (AOT) daily average data for all stations were obtained from the AERONET.

➢ A cloudless-sky day is characterized by a smooth curve in continuous line such as showed in Figure 2 (a). In a day with presence of cloud, the graph has peaks according to the radiation captured by the sensor in surface, as showed in Figure 2 (b).

➢In order to eliminate the uncertainties associated with the influence of cloudiness on solar radiation at the surface, were selected only cloudless-sky days, as showed in the Table 1.

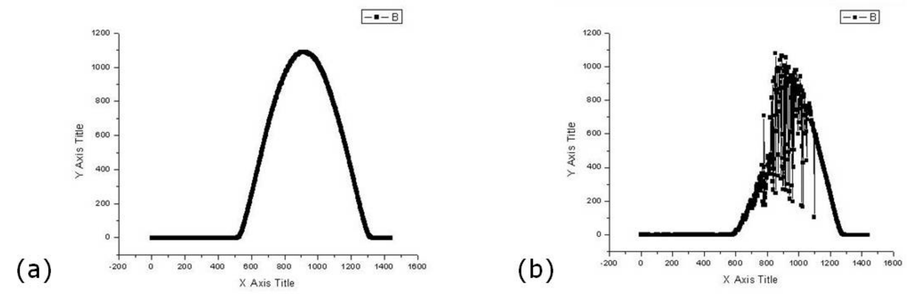

Figure 2 – Surface solar irradiation along a day without (a) and with the presence of clouds (b).

Table 1 –Number of cloudless-sky days at each site. Most of the them occurs in June, July and August during dry season in Brazilian Mid-West and Central regions

	Number of data	Years
Campo Grande - MS	43	2008
Cuiabá - MT	116	2006 to 2008
Petrolina - PE	31	2005 to 2007
Alta Floresta - MT	30	1999 to 2003

➢The K_{PAR} index is defined in Equation (1)

$$K_{PAR} = \frac{H_{PAR}}{H_0} \qquad (1)$$

where H_{PAR} is the daily PAR irradiation at the surface measured at SONDA site, H_0 is the solar radiation incident on the top of the atmosphere.

➢The data of Aerosol Optical Thickness (AOT) provided by AERONET keeps several wavelength, however the PAR radiation limits the spectral range among 400 nm to 700 nm, therefore only AOT data at wavelengths 675 nm, 500 nm and 440 nm were used in this work.

➢Three statistical empirical models were developed with the data: linear, polynomial of second degree and exponential. Only 70% of the available data were used to fit the statistical models to evaluate K_{PAR} parameter from AOT data at the specified wavelengths.

➢The 30% remaining data were used to evaluate the models performance. The performance evaluation was made by calculating the statistical deviations RMSE (Root Mean Square Error) and MBE (Mean Bias Error), defined in Equation (2) and (3) respectively.

$$RMSE = \left\{ \frac{\sum_{i=1}^{n} (y_i - x_i)^2}{N} \right\}^{1/2} \qquad (2)$$

$$MBE = \frac{\sum_{i=1}^{n} (y_i - x_i)}{N} \qquad (3)$$