Geophysical Research Abstracts
Vol. 14, EGU2012-1761-2, 2012
EGU General Assembly 2012

Analysis of Solar Irradiation Anomalies in Long Term Over India

M. Cony (1), J. Polo (2), L. Martin (1), A. Navarro (2), and I. Serra (1)

(1) IrSOLaV, Investigaciones y Recursos Solares Avanzados S.L., Tres Cantos, Spain, (2) Renewable Energy Division, CIEMAT, Madrid, Spain

India has a high potential for solar energy applications due to its geographic position within the Sun Belt and the large number of cloudless days in many regions of the country. However, certain regions of India, particularly those largely populated, can exhibit large aerosol loading in the atmosphere as a consequence of anthropogenic emissions that could have a negative feedback in the solar resource potential. This effect, named as solar dimming, has already been observed in India, and in some other regions in the world, by some authors using ground data from the last two decades. The recent interest in the promotion of solar energy applications in India highlights the need of extending and improving the knowledge of the solar radiation resources in this country, since most of the long term measurements available correspond to global horizontal radiation and most of them are also located big cities or highly populated areas. In addition, accurate knowledge on the aerosol column quantification and on its dynamical behavior with high spatial resolution is particularly important in the case of India, due to their impact on direct normal irradiation.

Long term studies of solar irradiation over India can be performed using monthly means of global hemispheric irradiation measurements from the Indian Meteorological Department. Ground data are available from 1964 till today through the World Radiation Data Centre that publish these values in the web. This work shows a long term analysis of solar irradiation in India using anomalies techniques and trends in ten places over India. Most of the places have exhibit a decreasing trend and negative anomalies confirming thus the darkening effect already reported by solar dimming studies. The analysis of anomalies has also found two periods of different behavior. From 1964 till 1988 the anomalies observed were positive and the last 20 years seems to be a period of negative anomalies. This observation is also consequent with solar dimming effect, apparently increased during the last two decades due to the increase of aerosol loading in the atmosphere.

These results remark the important of having accurate knowledge of atmospheric aerosol loading and its dynamics over India with high spatial resolution in the framework of solar energy deployment in the country. It is worth to mention that greater anomalies and a noticeable decreasing trend found in Calcutta could be correlated with the highly population rate, and thus the greater the population density of the area the greater the negative anomalies and the decreasing trend of solar irradiation monthly means.