EMS Annual Meeting Abstracts
Vol. 10, EMS2013-496, 2013
13th EMS / 11th ECAM

The Impact of Aerosols on Global Horizontal Irradiance over Southeastern Anatolia of Turkey

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In recent years, solar energy utilization in various applications has increased significantly. Solar energy is being seriously considered for satisfying a significant part of the energy demand in Turkey, as is in the world. Turkey is geographically located (36-42°N latitudes) in a useful position for the solar power in the South East of Europe and the Mediterranean. Southeastern Anatolia (SEA) region of Turkey which extends about 75,000 km2 and presents a flat topography is highly favorable for the utilization of solar energy. A photovoltaic power production is significantly dependent on Global Horizontal Irradiance (GHI), cloudiness and aerosols. GHI Solar irradiances are measured with a pyranometer (Kipp & Zonen CM3) from the Turkish State Meteorological Stations of Ceylanpınar, Bozova, Kilis, Şırnak, and Mardin at SEA of Turkey.
The aim of the study is to understand the impact of aerosols on GHI over the SEA region. For this purpose the satellite-generated aerosol optical depth (AOD) data from MODIS Terra are used to monitor air pollution. Because the AOD can reflect the amount of particles in the atmosphere.
In addition to AOD data, PM10 data from the surface air quality stations in SEA is used for the air quality stations of SEA (Kilis, Bozova, Mardin and Sırnak) are located at surrounding of the Syria and Iraq borders. The relationship of AOD and GHI are examined for spring (MAM) and summer (JJA) seasons. We compared the time series of GHI data with AOD for spring and summer of 2011. We found a weak negative relationship between AOD and GHI data for all sites. This may be attributed to the time shift of the measurement. However, the negative relationships may explain the influences between AOD and GHI. Similarly, AOD and PM10 data are compared for both seasons. The scatter plots reveal that there exists a lineership between PM10 and AOD 550nm in both season. The mean AOD levels in summer are higher than in the spring season.
Furthermore, an integrated WRF/HYSPLIT modeling approach for the assessment of PM10 source regions is run for the selected episode periods (exceeding air quality standard level) at 6-10 March 2011; 31 March- 3 April 2011; 14-21 April and 17-20 May 2011.