EFFECT OF DUST AEROSOL ON SURFACE SOLAR IRRADIANCE RETRIEVAL FROM SATELLITE OBSERVATIONS

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Atmospheric aerosols have the highest impact on the solar irradiance reaching the surface of the Earth under cloudless conditions. Aerosols scatter and absorb solar irradiance, resulting in an attenuation of the Direct Normal Irradiation (DNI) and an increase in the Diffused Horizontal Irradiation (DHI). Ultimately this causes the total Global Horizontal Irradiance (GHI) at the ground surface to reduce.

Pre-monsoon period in the arid and semi-arid regions of the Indian subcontinent is conducive to dust storm events due to the intense surface heating and steep atmospheric pressure gradients in Summer. This study analyzes the degradation in accuracy of satellite retrieved GHI under situations of high atmospheric dust aerosol content.

Heliosat method is used to derive cloud index maps from Meteosat-8 visible channel images for a period in June 2018 during which heavy dust storms were reported in Northern India. Two sources of clear sky data are utilized for transforming Cloud Index (CI) to GHI. They are Dumortier model with climatological turbidity values and CAMS McClear with measured or modelled Aerosol Optical Depth (AOD) values. The satellite estimates are validated against ground measured GHI from a BSRN station. Measurement of Particulate Matter from a nearby Air Quality monitoring station is used to analyze the dust Aerosol Optical Depth (AOD) modelled by CAMS. The results show that there is a large under-estimation of satellite retrieved GHI derived using the McClear model, while the GHI derived with Dumortier model shows over-estimation.