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# Development of a neural network model of cloudiness forecasting for solar energy purposes in Greece

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Although a considerable number of studies have been appeared for the estimation of global horizontal irradiance (GHI) over large areas, the accurate estimation with high spatial and temporal resolution is still a major challenge. Ground-based measurements of GHI are provided at many stations around the world but a sufficient coverage cannot be ensured everywhere since solar radiation is still rarely sampled compared to other environmental variables. To complement the surface networks, numerous methods have been developed to estimate the GHI from radiances measured from polar orbiting and geostationary satellites.
In this study, we present a novel method for the short-term (0-240 minutes) forecasting of GHI in Greece taking into account that cloudiness is the main atmospheric factor for the spatial and temporal distribution of surface solar irradiance. Images from the Spinning Enhanced Visible and Infrared Imager (SEVIRI) on the Meteosat Second Generation (MSG) were processed to retrieve the clearness index which is the GHI reaching the ground taking into account the presence of clouds and GHI for a cloud-free sky. Satellite data in a 3 year time period and with high spatial and temporal resolution (0.05o, 15 minutes) have been used for the training and testing of an artificial neural network (ANN). Based on the ANN results, the estimated and the measured values of clearness index are in good agreement: the maximum average mean standard error after 4:15 hours is 0.06 and 0.1during summer and winter respectively and corresponds to an error of 6 and 10% in GHI.