Geophysical Research Abstracts
Vol. 21, EGU2019-3773, 2019
EGU General Assembly 2019

Variabilities in direct and diffuse solar radiation at ∼2200 stations across China from 1958 to 2017

Yanyi He and Kaicun Wang

Beijing Normal University, College of Global Change and Earth System Science, Beijing, China (201621490027@mail.bnu.edu.cn)

Surface incident solar radiation (Rs), consisting of direct (Rdir) and diffuse solar radiation (Rdif), is one of the greatest potential energy sources compared to nonrenewable energy. and is an essential factor regulating the Earth's climate. It consists of direct (Rdir) and diffuse solar radiation (Rdif). Spatiotemporal variability of solar radiation (including Rs, Rdir and Rdif), even at seasonal timescales, is significant for solar energy applications. This study developed a method to estimate Rdir and Rdif based on sunshine duration and meteorological variables (e.g., air temperature and relative humidity). With the observations from 16 ground-based stations in China, , the estimations of Rdir and Rdif consequently with had high correlation coefficients (0.96 and 0.98) and relatively small standard deviations (15.49 and 5.93 W·m-2) compared to the observations from 16 ground-based stations in China. Furthermore, this method can accurately describe the relationship between Rdir and Rdif, by showing a similar sensitivity of Rdif to Rdir (-0.06±0.03, p=0.00) compared to the observations from the Baseline Surface Radiation Network stations (-0.08±0.03, p=0.00). Therefore, a dataset on Rdir and Rdif was established involvingThe method was applied to ∼2200 stations over China from 1958 to 2017. From 1958 to 1989, Rdir displayed a significant downtrend (-3.47 W·m-2/decade) whereas Rdif showed a significant uptrend (0.56 W·m-2/decade), especially over the North China Plain and parts of southern China. However, Ffrom 1990 to 2017, annual trends in Rdir (-0.49 W·m-2/decade) and Rdif (0.04 W·m-2/decade) were nonsignificant over China, mainly resulted from their opposite trends between cold (+) and warm (-) seasons (0.80 vs -1.78 W·m-2/decade for Rdir and 0.15 vs -0.07 W·m-2/decade for Rdif). These results will help decision-makers evaluate spatiotemporal risks associated with solar energy systems, especially at seasonal timescales.