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Assessment of SUNY Version 3 Global Horizontal and Direct Normal Solar Irradiance in Canada

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Abstract

In this paper, hourly, daily and annual solar resource data derived form the latest SUNY solar model (version 3) using visible and infrared satellite data is analysed and compared with ground measured solar data from eighteen northern-latitude locations distributed all across Canada. The statistics of spatial and temporal differences between the two datasets obtained from the two versions of SUNY model, i.e., V1 and V3, are analysed for both global horizontal irradiance (GHI) and direct normal irradiance (DNI). SUNY V3 GHI and DNI data set is also compared to a dataset produced by the MAC3 cloud layer model for ten northern-latitude locations across Canada. The MAC3 model, using ground-based data, is the basis of the weather design input data files referred to in the current Canadian Model National Energy Code. It is also the model used for generating the CWEEDS (Canadian Weather Energy and Engineering Data Sets) long term hourly dataset, which is in turn used to derive the CWEC files (Canadian Weather year for Energy Calculations) also called typical meteorological years. CWEC files are used for design and analysis in various applications, including buildings heating and cooling as well as solar systems.

Overall, results show that SUNY V3 has improved slightly compared to SUNY V1 in terms of estimating global and beam irradiance. Comparison of the SUNY V3 beta model with the MAC3 model seems to indicate that SUNY V3 model is resulting in better DNI estimates than those derived by the MAC3 model. Both SUNY V3 and MAC 3 models give similar estimates for GHI.

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