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New Capabilities in the National Solar Radiation Data Base

Manajit Sengupta, Aron Habte, Yu Xie, Grant Buster, Brandon Benton, and Jaemo Yang
National Renewable Energy Laboratory, Golden, United States of America (manajit.sengupta@nrel.gov)

The National Solar Radiation Database (NSRDB) provides global solar resource data at a high temporal and spatial resolution. This data is primarily used in solar energy modeling and is updated on a regular basis. The NSRDB uses a physical approach to satellite-based solar modeling. The underlying Physical Solar Model (PSM) computes cloud-properties using satellite remote sensing and subsequently solar radiation using radiative transfer models. The retrieved cloud properties include cloud-mask, cloud-type, cloud optical depth and cloud droplet size. The radiative transfer models require additional input parameters such as aerosol optical properties (AOD), preciptable water vapor, surface albedo, temperature and pressure to accurately model solar radiation. While cloud properties are obtained directly from the geostationary satellites other inputs are obtained from additional source such as the National Aeronautical and Space Administration (NASA) Modern Era Retrospective Analysis for Research and Applications version 2 (MERRA2), the Interactive Multisensor Snow and Ice Mapping System (IMS) model data from the U.S. National Ice Center and NASA's polar orbiting satellites such as the Moderate Resolution Imaging Spectroradiometer (MODIS) instruments on the Aqua and Terra Platform.

In 2022 the NSRDB was updated using the latest version of the underlying PSM. This update includes improved surface albedo and gap-filling of cloud properties. The inclusion of these updates reduced the uncertainty in the data compared to previous versions of the NSRDB. The Himawari and Meteosat Indian Ocean Data Coverage satellites were added to the Geostationary Operational Environmental Satellite and made our coverage global. While standard data from the GOES continues to be served at an hourly 4km x 4km resolution, full resolution data has also been made available to the user. The user is provided significant flexibility for downloading data depending on the amount of data required. Data can be downloaded using either the web-interface, an Application Programming Interface or directly from the cloud using Amazon Web Services. Services such as spectral data use on-demand computation and delivery.

Evaluation of the NSRDB was conducted for 18 stations and the the Mean Bias Error (MBE), Mean Absolute Error (MAE) and Root Mean Square Error (RMSE) were computed for both GHI and DNI. The evaluation was conducted for the 1998-2021 period. Generally, the MBE lies within plus or minus ±5% for GHI and ±20% for DNI. The RMSE is less than 30% for GHI and 35% for DNI.

Significant new updates are planned for 2023 including the use of the new FARMS DNI model under cloudy sky situations. There are additional plans to partition the NSRDB data using cloud

fraction when evaluating the accuracy of the NSRDB. This presentation will provide users with the latest information about the NSRDB as well as plans for future development and updates.