New benchmark for surface radiation dataset over East Asia-Pacific region

December 30 2021, by Li Yuan

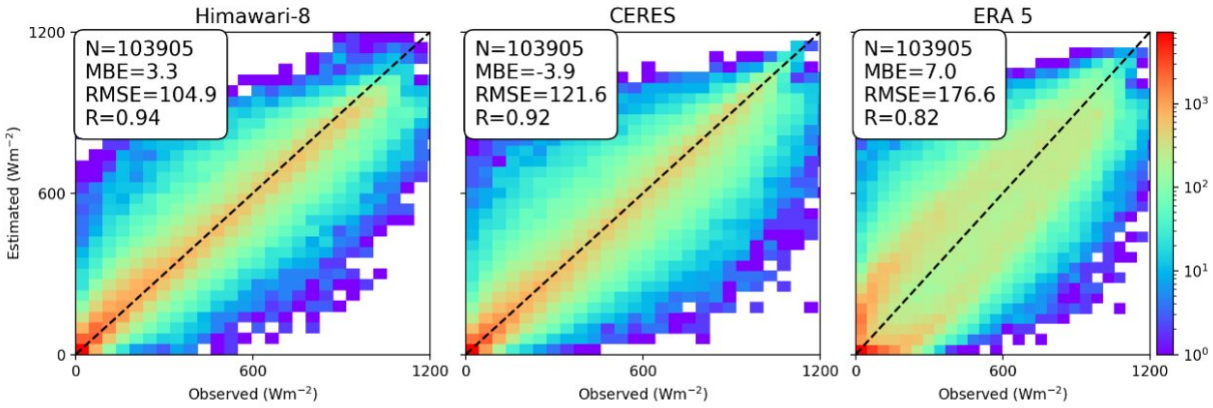

Fig. 1 Comparison of the hourly SWDR results of H-8, CERES and ERA5 to ground-based measurements in 2016. MBE and RMSE are expressed in Wm-2. The number of ground sites is 27. Credit: AIR

A joint research team led by Prof. Husi Letu from the Aerospace Information Research Institute (AIR) of the Chinese Academy of Sciences (CAS) has developed a new dataset, East Asia-Pacific longwave/shortwave downward radiation at the surface data set (2016–2020), from the new generation geostationary satellite Himawari-8.

Their study was published in *Bulletin of the American Meteorological Society*.

Researchers from the National Space Science Center of CAS, Sun Yat-sen University and Tokai University were also involved in the study.

Surface downward radiation (SDR), including shortwave downward radiation and longwave downward radiation, plays an important role in energy and climate studies. It serves as an important parameter for calculating the surface radiation budget, as well as an important input parameter for land surface, hydrology, climate and other models.

With the continuous launch of high temporal-spatial resolution satellites and the continuous improvement of remote sensing inversion algorithms, the demand for high-precision surface radiation products turns out to be urgent.

The generation of this new dataset is based on the look-up table method (for shortwave radiation) and the general parameterization method (for longwave radiation).

The main input data is the retrieved cloud properties including cloud optical thickness, cloud effective radius and cloud top temperature, combining with auxiliary data such as water vapor, surface temperature, and ozone derived from ERA5, the fifth-generation reanalysis global atmosphere dataset from the European Centre for Medium-Range Weather Forecasts.

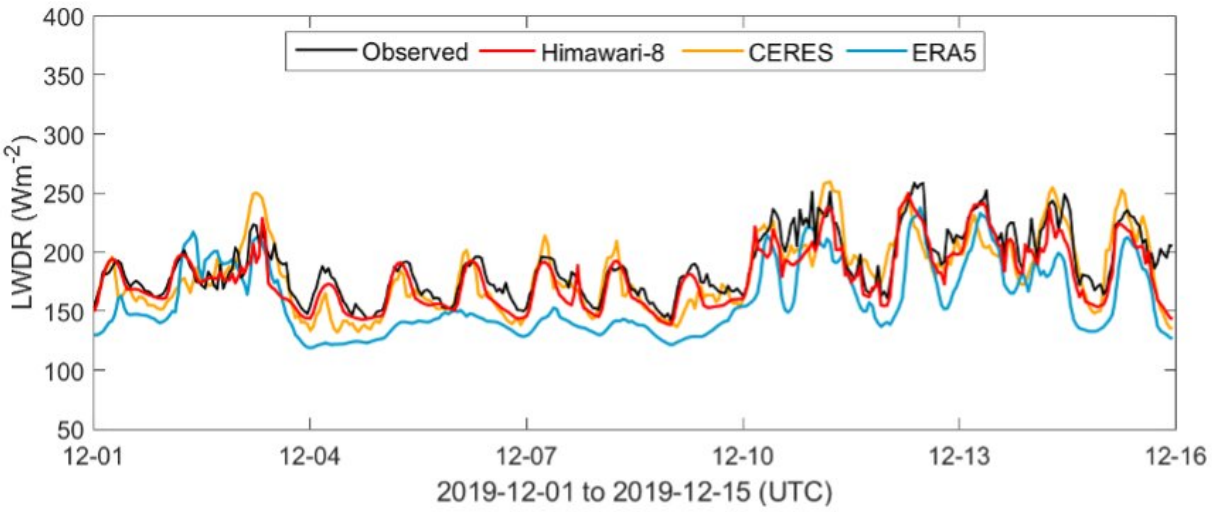

Fig. 2 Comparison of the diurnal variations in LWDR among CERES (1 h), ERA5 (1 h), H-8 (10 min) and ground-based measurements (10 min) from August 21-25, 2016. The zero-value dots during the nighttime denote invalid data. Credit: AIR

This method takes full advantage of the high spatial-temporal resolution (10min/5km) and wide spatial coverage of the Himawari-8 satellite (80E-200E, 60S-60N), and the time span is 2016–2020.

The researchers found that the accuracy of the shortwave radiation estimated by the Himawari-8 satellite was significantly higher than that of Clouds and Earth's Radiant Energy Systems (CERES). The overall accuracy of longwave radiation was comparable to the ERA5 products, and it showed better performance over high-altitude areas with a high spatial resolution.

The dataset can help improve the calculation accuracy and reveal the mechanism of the interaction between cloud-radiation-climate change.

More information: Husi Letu et al, A new benchmark for surface radiation products over the East Asia-Pacific region retrieved from the Himawari-8/AHI next-generation geostationary satellite, *Bulletin of the American Meteorological Society* (2021). DOI: 10.1175/BAMS-D-20-0148.1

Dataset: doi.org/10.11888/Meteoro.tpdc.271729

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