



Validation of Clear-Sky Global LAnd Surface Satellite (GLASS) Longwave Radiation Product

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Surface longwave (LW) radiation plays an important role in global climatic change, which consists of surface longwave upward radiation (LWUP), surface longwave downward radiation (LWDN) and surface longwave net radiation (LWNR). Numerous studies have been carried out to estimate LWUP or LWDN from remote sensing data, and several satellite LW radiation products have been released, such as the International Satellite Cloud Climatology Project Flux Data (ISCCP FD), the Global Energy and Water cycle Experiment Surface Radiation Budget (GEWEX SRB) and the Clouds and the Earth's Radiant Energy System Gridded Radiative Fluxes and Clouds (CERES FSW). But these products share the common features of coarse spatial resolutions (100-280 km) and lower validation accuracy.

Under such circumstance, we developed the methods of estimating long-term high spatial resolution all sky instantaneous LW radiation, and produced the corresponding products from MODIS data from 2000 through 2018 (Terra and Aqua), named as Global LAnd Surface Satellite (GLASS) Longwave Radiation product, which can be freely downloaded from the website (<http://glass.umd.edu/Download.html>).

In this article, ground measurements collected from 141 sites in six independent networks (AmerciFlux, AsiaFlux, BSRN, CEOP, HiWATER-MUSOEXE and TIPEX-III) are used to evaluate the clear-sky GLASS LW radiation products at global scale. The bias and RMSE is -4.33 W/m^2 and 18.15 W/m^2 for LWUP, -3.77 W/m^2 and 26.94 W/m^2 for LWDN, and 0.70 W/m^2 and 26.70 W/m^2 for LWNR, respectively. Compared with validation results of the above mentioned three LW radiation products, the overall accuracy of GLASS LW radiation product is much better. We will continue to improve the retrieval algorithms and update the products accordingly.