

Evaluation of AMATERASS surface solar radiation with ground-based observations in Japan

*Alessandro Damiani¹, Hitoshi Irie¹, Takashi Horio¹, Tamio Takamura¹, Pradeep Khatri², Hideki Takenaka³, Takashi Nagao³, Takashi Y. Nakajima⁴, Raul R. Cordero⁵

1. CReS, Chiba University, Japan, 2. Tohoku University, Japan, 3. EORC, JAXA, Japan, 4. Tokai University, Japan, 5. Santiago University, Chile

Observations from the new geostationary satellite Himawari-8 (H-8) are expected to contribute in further developing an efficient photovoltaic system for Japan through an improved energy management system (EMS). However, accurate comparisons with ground truthing observations are essential to assess their uncertainty. In this study, we evaluated Himawari-8 based AMATERASS surface solar radiation (SSR) by ground observations belonging to the SKYNET and JMA network in Japan. The accuracy of the SSR estimates resulted comparable or better than concurrent SSR products from other recent geostationary satellites at hourly time scale, although AMATERASS tends to slightly overestimate the observations. However, the agreement with ground-based observations depended on the time step used in the validation exercise as well as on the spatial domain. Worse agreement was found for the instantaneous time step, with the best root mean square error (RMSE) at the daily level. Comparisons with respect to the JMA stations showed that the magnitude of the RMSE was largely (scarcely) correlated with the amount of cloudiness in the central and southern (northern) regions. By contrast, bright albedo conditions can lead to a reduction or even a reversal of the sign of the mean differences between observations and AMATERASS estimates. Under clear-sky conditions, the influence of aerosols makes the AMATERASS estimates larger than ground observations and the diurnal pattern of the SSR difference was anti-correlated with AOD in different seasons. Overall, our analysis confirmed the good accuracy of the AMATERASS SSR product, and we expect it to play a key role in contributing to the development of an efficient EMS in Japan.

Keywords: Surface solar radiation, remote sensing, Himawari-8