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A new version of Global Satellite Mapping of Precipitation (GSMaP) product released in December 2021

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The Global Satellite Mapping for Precipitation (GSMaP) produces high-resolution and high-frequency global rainfall map based on multi-satellite passive microwave radiometer observations with information from the Geostationary InfraRed (IR) instruments (Kubota et al. 2020). Output product of GSMaP algorithm is 0.1-degree grid for horizontal resolution and 1-hour for temporal resolution. The GSMaP near-real-time version product (GSMaP_NRT) has been in operation at JAXA since November 2007 in near-real-time basis, and browse images and binary data available at JAXA GSMaP web site (<http://sharaku.eorc.jaxa.jp/GSMaP/>).

A new version of the GSMaP product was released in December 2021. We plan the reprocessing of the GSMaP standard version in a period during the past 24 years since Jan. 1998. The GSMaP algorithms consist of passive microwave (PMW) algorithms, a normalization module for PMW retrievals, a PMW-IR Combined algorithm, and a Gauge-adjustment algorithm. Features in the new version are summarized as follows. In the PMW algorithm, retrievals extended to the pole-to-pole. Databases used in the algorithm were updated. A method using frozen precipitation depths was newly installed (Aonashi et al. 2021). Heavy orographic rainfall retrievals were improved upon a basic idea of Shige and Kummerow (2016). The normalization module for PMW retrievals (Yamamoto and Kubota 2020) were newly implemented to make more homogeneous PMW retrievals, in particular, for microwave sounders. A basic idea of the PMW-IR combined algorithm is using morphing and Kalman filter (Ushio et al. 2009). In addition, a histogram matching method by Hirose et al. (2022) was implemented in the new version to reduce the IR retrievals with reference to the PMW retrievals. In the gauge-adjustment algorithm, a precipitation estimate is adjusted using the NOAA CPC Global Unified Gauge-Based Analysis of Daily Precipitation (Mega et al. 2019). Artificial patterns appeared in past versions were mitigated in the new version. Preliminary validation results using the gauge-adjustment ground radar data over the Japan land areas confirmed better results in the new version of the satellite only products.

Furthermore, the GSMaP real-time version (GSMaP_NOW) with the new algorithm was also released in December 2021. The GSMaP algorithm for the new version was also applied to the

GSMaP_NOW system after 6th December 2021. Accuracy improvements were confirmed also in the GSMaP_NOW products by validations with the gauge-adjustment ground radar data over Japan.