

New GSMP MWR Precipitation Detection Method for AMSR3

Kazumasa Aonashi and Shoichi Shige

Kyoto University

The conventional GSMP Microwave Radiometer (MWR) precipitation detection method (conventional method) underestimates precipitation areas over land and coast compared to DPR observations. In particular, the underestimation of orographic precipitation, such as that in Western Ghats, is significant. On the other hand, the conventional method overestimates precipitation areas over the ocean compared to DPR observations.

The objective of this study is to develop a new precipitation detection method for AMSR3 that alleviates these issues. This study first developed a new precipitation detection method for GMI using the abundant GMI and DPR matchups. To this end, we checked the GMI surface emissivity (E_s) and the ratio of brightness temperatures (TBs) to surface temperature (T_s) (TB/T_s) in both the DPR precipitation areas and the non-precipitation areas. We also investigated variations in these physical variables in terms of surface conditions (particularly the fraction of water (FOW)) and orographic precipitation indices. Based on these results, we developed a model to regress the DPR precipitation fraction using GMI E_s , TB/T_s , FOW, T_s , and the orographic precipitation indices as inputs. Next, to apply this new GMI precipitation detection method to AMSR3, we made a linear regression model to synthesize GMI TBs from AMSR3 TBs.

This study compared the precipitation fraction retrieved by the conventional method and the new precipitation detection method for AMSR3 with observations from the DPR and ground radars for several cases in 2025. The results showed that the new precipitation detection method retrieved larger (smaller) precipitation fractions over land and coast (sea) compared to the conventional method, bringing it closer to the observations.