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Evaluation of the precipitation-type dependent uncertainty in rain/no-rain classification using PCT from GPM/GMI data

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Spaceborne passive microwave sensors have been developed to improve the knowledge of precipitation systems based on channels that interact directly with hydrometeors in clouds. In particular, understanding the global distribution of precipitation is one of the main missions. Prior to these precipitation studies, many researchers tend to implement the rain/no-rain classification (RNC) procedure. As a simple way, the polarized corrected temperature at 89 GHz (PCT89) from passive microwave radiometry has been widely used to identify rain pixels. The PCT89 can estimate the scattering intensity accompanied by precipitating clouds while minimizing the effects of the surface at high resolution, however, the diversity of the hydrometeor distributions can be a problem in the use of a consistent cut-off threshold. Therefore, the purpose of this study is to evaluate differences in the accuracy of the PCT-based RNC method induced by the various hydrometeor distributions and to present a new perspective to users so that it can be used appropriately. Precipitation data observed by the global precipitation measurement (GPM) microwave imager (GMI) for the period from January to December of 2015 in the tropics were used in the study. Based on the classification algorithm of the GPM dual precipitation radar (DPR), the precipitation data were subdivided into 11 types (3 stratiform types, 4 convective types, and others), and then a statistical verification was attempted to ensure that the cut-off threshold was appropriate. The PCT89-based RNC method leads to an increase of 70% and 54% in the number of two significant stratiform types compared to the DPR precipitation flag. On the other hand, the convective types decreased by up to 53%. Although regional diversity could lead to systematic differences in the verification, they did not exceed magnitudes of the difference between precipitation types. Therefore, this study suggests that the precipitations identified by the PCT89-based RNC method have features that enhance the bias toward the stratiform type.