Comparison of Aqua/Terra MODIS and Himawari-8 Satellite Data on Cloud Mask and Cloud Type Classification Using Split Window Algorithm

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Abstract	Cloud classification is not only important for weather forecasts, but also for radiation budget studies. Although cloud mask and classification procedures have been proposed for Himawari-8 Advanced Himawari Imager (AHI), their applicability is still limited to daytime imagery. The split window algorithm (SWA), which is a mature algorithm that has long been exploited in the cloud analysis of satellite images, is based on the scatter diagram between the brightness temperature (BT) and BT difference (BTD). The purpose of this research is to examine the usefulness of the SWA for the cloud classification of both daytime and nighttime images from AHI. We apply SWA also to the image data from Moderate Resolution Imaging Spectroradiometer (MODIS) onboard Aqua and Terra to highlight the capability of AHI. We implement the cloud analysis around Japan by employing band 3 (0.469 mu m) of MODIS and band 1 (0.47 mu m) of AHI for extracting the cloud-covered regions in daytime. In the nighttime case, the bands that are centered at 3.9, 11, 12, and 13 mu m are utilized for both MODIS and Himawari-8, with somewhat different combinations for land and sea areas. Thus, different thresholds are used for analyzing summer and winter images. Optimum values for BT and BTD thresholds are determined for the band pairs of band 31 (11.03 mu m) and 32 (12.02 mu m) of MODIS (SWA31-32) and band 13 (10.4 mu m) and 15 (12.4 mu m) of AHI (SWA13-15) in the implementation of SWA. The resulting cloud mask and classification are verified while using MODIS standard product (MYD35) and Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observation (CALIPSO) data. It is found that MODIS and AHI results both capture the essential characteristics of clouds reasonably well in spite of the relatively simple scheme of SWA based on four threshold values, although a broader spread of BTD obtained with Himawari-8 AHI (SWA13-15) could possibly lead to more consistent results for cloud-type classification than SWA31-32 based on the MODIS sensors.
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