Improvement of snow detection product from Himawari-8 and the validation

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Himawari-8 carries the Advanced Himawari Imager (AHI) which has 16 bands in the visible, near-infrared and infrared bands (Bessho et al., 2016). In particular, near-infrared bands are known as useful tools to detect snow and ice area. These bands are used for snow and ice detection as a part of Himawari-8 Cloud Mask Product (CMP) that has been in operation since 7 July 2015(Imai and Yoshida, 2016).

The validation result of snow detection shows underestimate of snow cover on the vegetation area and high latitudeinal area (Ioka et al., 2016). In the sea ice detection part, this algorithm composites the detection result from AHI with the microwave sea ice product. It causes deterioration of spatial resolution because the microwave sea ice product has low spatial resolution than AHI. Furthermore, this product composites the 4-day result by the OR bond. It causes overestimate of sea ice and missdetection affect to the result for 4-days.

Based on the above, we developed the new snow/ice detection algorithm from AHI (Ioka et al., 2017). That algorithm works better than snow detection of CMP but it still has some problems about missdetection of ice cloud as snow cover and overestimate of snow detection on the desert area and the vegetation area that has high Nomalized Difference Vegetation Index (NDVI) value.

To resolve these problems, we modified the cloud detection algorithm and snow detection algorithm. At first, we added desert area detection before the cloud and snow detection. It contributes to reduce overestimate of snow on the desert area. Second, several conditionals are added to cloud detection by the OR bond to detect middle and high altitude ice clouds. Third, conditional of NDWI is added to reduce overestimate of snow on vegetation area.

The result of modified snow detection algorithm shows the reduction of overestimate on the desert area and the high NDVI area. The result of modified cloud detection shows reduction of underestimate of ice clouds. These modification contributes to decrease overestimate of snow area.

The snow detection area derived from AHI is compared with in-situ observation datasets. In Japan area, we compared it with AMeDAS snow depth dataset. In the Eurasia region, we compared it with Global Historical Climatology Network-Daily(GHCND) (Menne et al., 2012) and Russian in-situ snow survey data from the Former Soviet Union(RSFSU) (Bulygina et al., 2015) and the sea ice detection area derived from AHI is compared with the Northern-Hemisphere sea ice distribution chart of JMA.

These validation results show that result of the snow/ice detection from AHI is consisted to in-situ observation datasets and sea ice distribution chart.

References

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