Global cloud distribution revealed by combined use of CloudSat/CALIPSO: Comparison of using CALIPSO version 2 and 3 data

Y. Hagihara and H. Okamoto

Research Institute for Applied Mechanics, Kyushu University, Fukuoka, Japan (hagihara@riam.kyushu-u.ac.jp)

We newly compiled the cloud distribution using CloudSat and CALIPSO lidar measurements. The CALIPSO standard "Vertical Feature Mask (VFM)" has been widely used as a cloud or aerosol mask. However, several studies noticed that the VFM has a tendency to occasionally label noise or aerosols as cloud (and vice versa) and these misclassification further propagates to the larger areas through the horizontal averaging. It should be added that this contamination had an influence on the standard combined CloudSat/CALIPSO cloud mask (2B-GEOPROF-LIDAR). We first developed a cloud mask scheme for CALIPSO that utilized threshold of attenuated total backscattering coefficient and spatial continuity test. The former criterion was originally developed for the ground-based lidar system and was used to exclude aerosols. We then developed combined CloudSat/CALIPSO cloud mask. In this study, these cloud mask schemes were applied and vertical distribution of zonal mean cloud fractions and cloud coverage were investigated. Also, the differences between using the previous (Version 2) and the latest release (V3) CALIPSO data were discussed.

From the results during September-November 2006, the difference between the result from our CALIPSO and VFM scheme was especially significant in low-level clouds (>680 hPa). The cloud fraction difference (VFM - our scheme) below 2 km was up to +20% for V3. It was decreased about 15% by comparison to V2. We also compared the zonal mean cloud coverage for the topmost layer detected by sensors from the following four methods; our CALIPSO scheme, the VFM, the combined CloudSat/CALIPSO scheme, and Aqua/MODIS results. In the low level, the MODIS result was larger than that of other methods, and results from our CALIPSO scheme and the VFM differed by 5% for V3, which was smaller difference compared to 15% for V2. The CALIPSO, CloudSat/CALIPSO, and MODIS results were similar for total cloud coverage, but the VFM result showed the largest cloud coverage in middle and low latitudes because of the misclassification in the low level and the lager coverage than that of our scheme in the high level for V3. These results imply the issues of the VFM as stated above were still remained for V3. In the presentation, we extend the analysis to about five years (June 2006 to April 2011).