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STUDY ON THE NEW APPROACH OF THIN CLOUD DETECTION USING VISIBLE SPECTRAL CHANNELS OVER NORTHEAST ASIA REGION

Abstract

The world's first geostationary ocean color observation satellite, Geostationary Ocean Color Imager (GOCI) boarded on COMS, can effectively observe not only various ocean phenomena surrounding the Korean peninsula, but also atmospheric aerosol or vegetation over the land surface with the high temporal and spatial resolution. GOCI scans its images at every hour for eight hours, thereby obtaining 8 GOCI images a day with 500m horizontal resolution. Therefore, utilizing these advantages of GOCI datasets is very helpful for a number of non-ocean researches such as land application and meteorological analysis as well over the Northeast Asia region including the Korean peninsula, Japan, and the Eastern China. However, since the GOCI sensor has only visible (VIS) and near infra-red (NIR) spectral channels, it is absolutely hard to apply the ordinary cloud detection method with longwave wavelength channels such as infra-red (IR). In this study, the new approach of cloud detection algorithm using GOCI data was presented. We modified the cloud detection method and improved its masking result with expanding the study area comparing with the previous study, Kim et al. (2017). To supplement the absence of IR spectral bands, the differences between top-of-atmosphere (TOA) reflectance and the background surface reflectance simulated by the bi-directional reflectance distribution function (BRDF) model were utilized and the difference can be comprehended equal to the pure atmospheric effect. Concept of the detection method using the difference is similar with the previous research, but the minimum differences in reflectance between TOA and surface during 16 days were calculated as the reference of clear-sky day at each pixel in this study. Using the advanced cloud masking method, detection results can be categorized four types of atmospheric condition, "Thick Cloud", "Thin cloud", "Probably Clear", and "Certainly Clear". To accurately distinguish the certainly clear area, the pixel with high NDVI (Normalized Difference Vegetation Index) is additionally considered as the clear sky area. As a result, the probability of detection (POD) value indicated quantitatively reasonable result in case of all cloud detections when comparing with CALIPSO vertical feature mask (VFM) data as observations. Furthermore, by applying the new cloud detection method to recently launched geostationary satellite or future satellites, we anticipate that the flexibility of the detection algorithm could be validated in the presentation.