Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

ACG09-P01 Room:Convention Hall Time:May 27 18:15-19:30

Cloud-top Height Esimation Method by Geostationary Satellite Split-Window Measurements Trained with CALIPSO data

NISHI, Noriyuki[1*] ; HAMADA, Atsushi[2] ; HIROSE, Hitoshi[3]

[1]Science Faculty, Fukuoka University, [2]AORI, University of Tokyo, [3]CEReS, Chiba University

We released a database of cloud top height and visible optical thickness (CTOP) with one-hour resolution over the tropical western Pacific and Maritime Continent, by using infrared split-window data of the geostationary satellites (MTSAT) (http://database.rish.kyoto-u.ac.jp/arch/ctop/). We made lookup tables for estimating cloud top height only with geostationary infrared observations by comparing them with the direct cloud observation by CloudSat (Hamada and Nishi, 2010, JAMC). We picked out the same-time observations by MTSAT and CloudSat and regressed the cloud top height observation of CloudSat back onto 11 micro m brightness temperature (Tb) and the difference between the 11 micro m Tb and 12 micro m Tb of MTSAT. The database contains digital data and quick look images from Jul 2005 to real time and the area in 85E-155W (MTSAT2) and 20S-20N.

Though the CTOP dataset is particularly useful for the upper tropospheric clouds, it has one serious problem. The cloud radar onboard CloudSat cannot well detect the optically thin cirrus clouds composed of small ice crystals and misses a certain part of cirriform clouds in the upper troposphere. In order to overcome this weakness, we are now making next version of the CTOP by using the lidar data (CALIOP) onboard CALIPSO satellite. One problem on the use of lidar observation is that they observe very thin cirrus formed around the tropopause. The main purpose of CTOP dataset is to provide the top height of clouds that originate from cloud clusters including cumulonimbus and nimbostratus, not of in-situ cirrus clouds formed near the tropopause. To exclude the very thin tropopause cirrus, we define cloud-top height of CALIOP observation as the height at which the optical depth accumulated from the cloud top is 0.2, instead of the CALIOP cloud top itself. With this criterion we can succeed in estimating the top height of cirruiform clouds, but it has another problem for thick clouds like cumulonimbus. For such clouds, the height of accumulated optical depth 0.2 is considerably lower than the real cloud top, possibly due to rather small number of large cloud particles near the top. Therefore, the estimation using CloudSat data is closer to the real top for the thick clouds, while that using CALIOP data is closer for cirriform clouds. So we are now making a lookup table with using both CloudSat and CALIPSO data to estimate cloud-top heights both for thick and thin clouds seamlessly.

Keywords: cloud top, geostationary satellite, split window, cirrus, tropical meteorology