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The use of cloud classification and rainfall radar data to improve geostationary satellite based rainfall estimation

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Dwi Prabowo Yuga Suseno[1*], Tomohito J. YAMADA[1]
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[1]Grad. Sch. Eng. Hokkaido University
[1]Grad. Sch. Eng. Hokkaido University

The use of geostationary satellite dataset for rainfall estimation has several advantages that it has a hemisphere coverage and high temporal resolution. However, we can only use Visible/Infra Red (VIS/IR) sensor that carried by geostationary satellite. Because of the cloud is opaque in VIS/IR spectral band, an indirect approach is used for rainfall estimation, i.e. according to several top surface cloud characteristics such as shape, brightness, temperature etc. Another rainfall estimation approach is by using Passive Micro Wave (PMW) sensor. The microwave spectral band has characteristic that can penetrate the cloud and interact with the hydrometeor. Those of characteristics make the PMW method more direct in term of rainfall estimation. PMW sensor usually mounted on polar orbit satellite, so it has limitation on temporal resolution and coverage. This study combines the advantage of geostationary satellite and PMW satellite images for rainfall estimation. We use MTSAT datasets that is blended with TRMM 2A12 to estimate the rainfall over Japan. We make a statistical relationship between cloud top temperature from MTSAT and rainfall rate from TRMM 2A12, according to assumption that on the convective cloud situation lower cloud top temperature is associated with higher rain rate. In the actual situation such assumption sometimes cannot be fulfilled. The cloud top temperature of the cirrus cloud i.e.: cold but not produces rain and the nimbostratus cloud i.e.: produces rain but warm have disturbed such relationship. The cloud classification according to the cloud type and cloud height will be performed. We use several cloud classification methods such as segmentation method, split-window method and maximum likelihood method to classify the cloud type. We investigate the statistical relationship among cloud classes and height to the rain rate. A calibration with the C-band rainfall radar data will also be conducted. The estimation result will be validated with the measured rainfall (Automated Meteorological Data Acquisition System/AMeDAS System). We expected that cloud classification based on cloud type and height as well as C-band rainfall radar calibration will improve the rainfall estimation accuracy.

キーワード: geostationary satellite, rainfall estimation, MTSAT, TRMM 2A12, cloud classification
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