

## CloudSat と TRMM/PR を用いた降水の特徴の解析について Analysis of rain characteristics by using CloudSat and TRMM/PR

高橋 暢宏<sup>1\*</sup>  
TAKAHASHI, Nobuhiro<sup>1\*</sup>

<sup>1</sup> 情報通信研究機構

<sup>1</sup>National Institute of Information and Communications Technology

Spaceborne cloud/precipitation radars are suitable for understanding the global climate (especially precipitation in this study) that means both the average figure of the Earth climate and the local climate in the global climate. In terms of precipitation climatology, major parameters are the precipitation amount and its diurnal/seasonal changes as well as the drop size information that is a kind of proxy of the precipitation processes such as warm/cold rain. The purpose of this study is to develop the climate map of precipitation by using CloudSat that equips W-band (94 GHz) radar and TRMM/PR that equips Ku-band (13.8 GHz) radar; rain amount is estimated by the TRMM/PR level 2 product (2A25) and the drop size information is obtained by combining the CloudSat and TRMM/PR. The basic idea of the analysis method is to compare the histograms of radar reflectivity factor ( $Z$ ) at near-surface range bin at the overlapping  $Z$  range (weak to moderate rain echo). Because the both satellites have different orbit, only the statistical approach is available. Since the different Mie scattering effect appears for the different frequency and drop size, the  $Z$  value of rainfall is different between w- and Ku-band radar observations and it reflects the difference in the histograms of w- and Ku-band. Based on these characteristics, drop size information is estimated by comparing the histograms. In this study, median diameter ( $D_0$ ) is estimated. For the comparison of the estimation,  $D_0$  is estimated by TRMM/PR only.

Climate data are created in  $10 \times 10$  degrees in latitude and longitude boxes and each box consists of the unconditional and conditional rain rate (the former corresponds the rain amount) and  $D_0$  (median diameter) both from the CloudSat-TRMM/PR combined analysis and TRMM/PR-only analysis for every seasons (DJF, MAM, JJA, and SON), diurnal cycle (night time/day time orbit) and over land or ocean.

The results show that the general characteristic of global maps of  $D_0$  through the year and local time is apparent land-ocean contrast; larger  $D_0$  appears over land and smaller  $D_0$  appears over ocean except for relatively small  $D_0$  over southeastern Asia to China. Also, relatively larger  $D_0$  appears in tropical area and mid latitude summer. Diurnal change of  $D_0$  can be seen by comparing the day/night time  $D_0$ ;  $D_0$  is larger in the night time over ocean while day time  $D_0$  is larger over land. Tropical Ocean shows smaller seasonal change, while larger changes are seen over mid-latitude area. Comparison of the two estimates of  $D_0$  between CloudSat-TRMM/PR combined estimation and TRMM/PR-only estimation.

Since the Dual-frequency Precipitation Radar (DPR) onboard Global Precipitation Measurement (GPM) core satellite, which is launched in February 2014, can estimate the drop size distribution (DSD), the approach in this study can be useful of evaluation of the algorithm for DSD estimation.

Keywords: rain, drop size distribution, CloudSat, TRMM