Analysis of the Surface Echo Characteristics Derived from GPM/DPR Wide Swath Observation Experiment

*Kosuke Yamamoto[1], Kinji Furukawa[1], Nobuhiro Takahashi[2], Takuji Kubota[1]

1. Japan Aerospace Exploration Agency, 2. Nagoya University

The observation from spaceborne precipitation radar has been contributed to better understanding of earth climate system. Global Precipitation Measurement (GPM) core satellite Dual-frequency Precipitation Radar (DPR) provides us 3-dimentional information of precipitation by the scan width of about 250 km, but there have been arguments that to bring systematic impact on the weather monitoring through global rainfall map such as GSMaP, wider swath observation by precipitation radar is necessary.

Based on those requirements, the scan pattern of GPM/DPR was experimentally changed for 1 day from 13UTC on September 26th. In this experiment, the scan angle was changed to observe from nadir to about +34˚ assuming future spaceborne precipitation radar with wider swath width, while in the normal observation DPR scans ±17˚. The height and strength of the mainlobe clutter with larger incident angle were assessed statistically to examine the possibility of the rainfall retrieval with wide swath observation by DPR.

In order to examine mainlobe clutter height, it is inevitable to reduce sidelobe and grating lobe effect. In this study, clutter-free observation data is extracted based on following procedures; 1) extract bins above mainlobe clutter; 2) extract bins under non-precipitation condition from 1); 3) extract bins that satisfy |received power −averaged noise power| < 2 sigma of the noise power from 2). Note that this procedure was applied only for KuPR observation since sidelobe and grating lobe clutter is not prominent in KaPR.

The result for KuPR observation shows that the mainlobe clutter top height at the larger incident angle over ocean is somehow suppressed at around 4 km while over land it increases almost linearly up to around 5 km due to the strong surface scattering. The same tendency is found on the KaPR observation, but it has lower clutter top height of around 2.5 km and 3.5 km, over ocean and land respectively. Suppression is clearer over ocean thanks to the specular reflection. The results also indicate that relatively intense rainfall can be retrieved while shallow rainfall with weak echo power may not be acceptable for retrieval because it should be masked by the surface clutter.

Keywords: precipitation radar, radar clutter, GPM core satellite