全球降水観測（GPM）計画および
水循環変動観測衛星「しずく」（GCOM-W）による高緯度観測

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Observations of High Latitude Regions by the Global Precipitation Measurement (GPM) Mission and Global Change Observing Mission – Water (GCOM-W)

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Currently, the Japan Aerospace Exploration Agency (JAXA) operates two missions related to global water cycle. One is the Global Change Observing Mission – Water (GCOM-W or "SHIZUKU"), which was launched in May 2012, and the other one is the Global Precipitation Measurement (GPM) Core Observatory, which is a U.S.-Japan joint mission and was launched in February 2014.

The GCOM-W satellite carries the Advanced Microwave Scanning Radiometer 2 (AMSR2), which is a multi- is multi-frequency, total-power microwave radiometer system with dual polarization channels for all frequency bands (Imaoka *et al.*, 2010). Basic characteristics of AMSR2 are similar to that of AMSR-E on board the Aqua satellite to continue the AMSR-E observations. Table 1 is major characteristics of AMSR2. Standard products of AMSR2 geophysical parameters are integrated water vapor, integrated cloud liquid water, precipitation, sea surface temperature, sea surface wind speed, sea ice concentration, snow depth, and soil moisture content. AMSR2 geophysical parameters, sush as sea ice concentration, are already used in studies and operational applications in high-latitudes, fully utilizing legacy of AMSR-E. Also, the GCOM-W satellite is participating to the GPM mission as one of constellation satellites, which carry passive microwave imager and/or sounder and collaborate with the GPM Core Observatory for frequent and high accurate global precipitation observation.

The GPM Core Observatory carries two instruments. One is the Dual-frequency Precipitation Radar (DPR), which was developed by JAXA in collaboration with the National Institute of Information and Communications Technology (NICT). DPR is a successor of the Precipitation Radar (PR) on board the Tropical Rainfall Measuring Mission (TRMM) satellite. The other one is the GPM Microwave Imager (GMI), which was developed by NASA. GMI is a successor of the TRMM Microwave Imager on board the TRMM satellite (Hou *et al.*, 2014). While the TRMM satellite is focused on the rainfall observation over tropical and subtropic regins, the GPM Core Observatory has inclination angle of 65 degree that enables precipitation (both liquid and solid) observations from tropics to mid- and high-latitudes. In this regard, DPR has 35.5 GHz (Ka-band) radar, which has sensitivity to weak rain and snow, in addition to 13.6 GHz (Ku-band) radar that is same spcifiction as PR, and GMI has higher frequency channels around 166 and 183 GHz to observe solid precipitation. Because of its bigger antenna size (1.2 m) than that of TMI (0.6 m) and lower satellite altitude compared to the other polar orbital passive microwave imagers, GMI provides one of finest resolution. Table 1 is major characteristics of GMI. DPR and GMI started their scientific observation since March 2014. Figure 1 is first light images of extratropical cyclone, located outside of the TRMM satellite's coverage, captured by DPR and GMI. Information of rain and snow by simultaneous observation by radar and microwave imager on the GPM Core Observatory will provide valuable information for studies of mid and high latitudes. Recently, we started development of retrievals algorithms for SST and sea ice using data from the GPM Core Observatory, based on the algorithm of AMSR2. Those are not main targets of the GPM mission but will extend possibility of GPM data utilization in other reserch and operational fields.

Table 1 Major characteristics of AMSR2

Antenna size [m]	2.0						
Swath width [km]	1,450 (effective > 1,600)						
Satellite altitude [km]	699.6						
Frequency [GHz]	6.925 (V/H)	7.3 (V/H)	10.65 (V)	18.7 (V/H)	23.8 (V)	36.5 (V/H)	89 (V/H)
Ground resolution [km]	35 x 62	35 x 62	24 x 42	14 x 22	15 x 26	7 x 12	3 x 5

Table 2 Major characteristics of GMI

Antenna size [m]	1.2							
Swath width [km]	885							
Satellite altitude [km]	407							
Frequency [GHz]	10.65 (V/H)	18.7 (V/H)	23.8 (V)	36.64 (V/H)	89 (V/H)	166 (V/H)	183.31±3 (V)	183.31±7 (V)
Ground resolution [km]	32.1 x 19.4	18.1 x 10.9	16 x 9.7	15.6 x 9.4	7.2 x 4.4	6.3 x 4.1	5.8 x 3.8	5.8 x 3.8

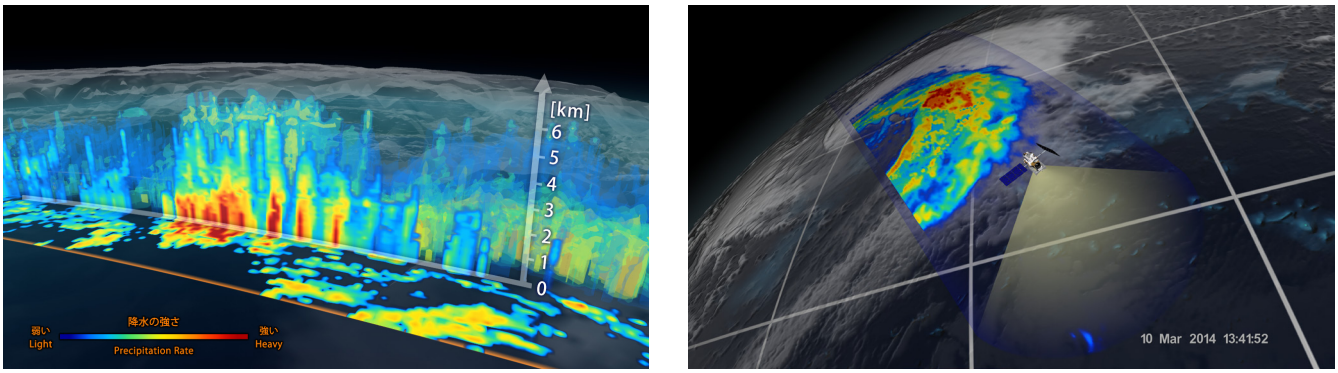

Figure 1. First light of the GPM Core Observatory, observing extratropical cyclone in the northwest Pacific Ocean at 22JST on March 10, 2014. Left: Three dimensional precipitation structure by DPR. Right: Near-surface precipitation by GMI.

References

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