Global Precipitation Measurement (GPM) mission in Japan and future Japanese Precipitation Measuring Mission (PMM)

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The GPM mission consists of the GPM Core Observatory jointly developed by U.S. and Japan and Constellation Satellites that carry microwave radiometers and provided by the GPM partner agencies. The GPM Core Observatory, launched on February 2014, carries the Dual-Frequency Precipitation Radar (DPR) by the Japan Aerospace Exploration Agency (JAXA) and the National Institute of Information and Communications Technology (NICT).

The JAXA and the European Space Agency (ESA) have jointly developed the Earth Cloud Aerosol and Radiation Explorer (EarthCARE) satellite, which was successfully launched in May 2024. Since December 2025, JAXA and ESA have begun providing all EarthCARE standard data products openly to the public, offering unprecedented insights into clouds, atmospheric aerosols, and the Earth's radiation budget. The CPR, developed by JAXA and the NICT, is the world's first spaceborne Doppler radar in the W-band (94 GHz), capable of measuring internal cloud structures and vertical motions.

Both the GPM Core Observatory and the EarthCARE satellite are low Earth orbit satellites flying at altitudes of 400 to 450 km, but the GPM Core Observatory follows a non-sun-synchronous orbit while the EarthCARE satellite follows a sun-synchronous sub-recurrent orbit. Due to the difference in these orbits, when the orbits of both satellites intersect at the same timing, such combined observational data can be utilized. JAXA began distribution of a dataset related to clouds and precipitation that combines simultaneous observation data from the GPM Core Observatory and the EarthCARE satellite in November 2025.

As a future precipitation observation mission from space based on the achievements from the TRMM, the GPM, and the EarthCARE, JAXA has developed the Precipitation Measuring Mission (PMM) carrying a higher sensitivity Ku-band (13GHz) Doppler precipitation radar (KuDPR). As the Ku-band Radar enables us retrievals in heavy precipitation, it is expected to provide unique information, in particular, over vigorously convective regions. Observations of the precipitation vertical motion will contribute to improvements of microphysics schemes in weather models.