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Scientific progresses from 15 years observation of TRMM and expectations to the GPM

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Tropical Rainfall Measuring Mission (TRMM) satellite, which was launched in November 1997, is a unique satellite equipped with a space-borne precipitation radar (PR). TRMM satellite has continued observation of precipitation from space for more than 15 years and has accumulated valuable data. Even one of the very early images obtained from TRMM PR surprised scientists with a discovery of precipitating particles at the level as high as 18km from the earth surface.

The primary advantage of the TRMM observation is its 3-dimensional measurements of precipitation with TRMM PR. Besides, its sun-unsynchronous orbit observation, multi-sensors (PR, TMI, VIRS, LIS, and CERES), as well as accumulation of 15 years continuous observation data provide us with very precious scientific data. They enabled us not only to improve the accuracy of precipitation estimates in the tropics and subtropics, but also to characterize the precipitation from region to region, thus revealed the mechanism and its variations of meteorological state associated with various types of precipitation. In such manner, 15 years of observation with TRMM brought us unprecedented opportunity for the progress of precipitation sciences.

On the other hand, TRMM data availability enabled us to estimate the diabatic heating of the atmosphere with moist convection, which is important to understand the large-scale circulation of the atmosphere on earth, and to evaluate the climate models. It is also utilized aiming to contribute to the infrastructure of flood alert systems as a flying precipitation gauge.

In this paper, we review the scientific achievements in Japan with TRMM, and discuss our expectations to the upcoming Global Precipitation Measurement (GPM) Mission; GPM will cover 65N-65S, with its primary satellite equipped with Dual-frequency Precipitation Radar (DPR), associated with a constellation of satellites equipped with Microwave Imagers to cover the globe in 3hourly temporal resolutions.

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