Nakamura, K., 2021: Progress from TRMM to GPM. *J. Meteor. Soc. Japan*, **99**, Special Edition on Global Precipitation Measurement (GPM): 5th Anniversary, https://doi.org/10.2151/jmsj.2021-035.

Plain Language Summary: The Tropical Rainfall Measuring Mission (TRMM) satellite was launched in 1997, and the observations continued for more than 17 years. The features of TRMM observation were as follows:

(a) It followed a non-sun synchronized orbit that enabled the diurnal variation of precipitation to be investigated.

(b) It carried a precipitation radar (PR) and microwave and infrared radiometers along with a lighting sensor and a radiation budget sensor, which enabled the study of the global characteristics of precipitation systems, as an example shown in Fig. 1.

(c) It worked as a standard reference for precipitation measurements for other spaceborne microwave radiometers, which enabled global rain maps to be developed.

On the basis of the great success of TRMM, the Global Precipitation Measurement (GPM) was designed to expand TRMM's coverage to higher latitudes. The core satellite of GPM is equipped with a Ku/Ka dual-frequency precipitation radar (DPR) and a microwave radiometer. DPR can discriminate solid from liquid precipitation. The period of the precipitation measurement from space extended to more than 23 years, which deepens the understanding of global precipitation climatology. This paper attempts to highlight Japan's contributions to the science of these missions.

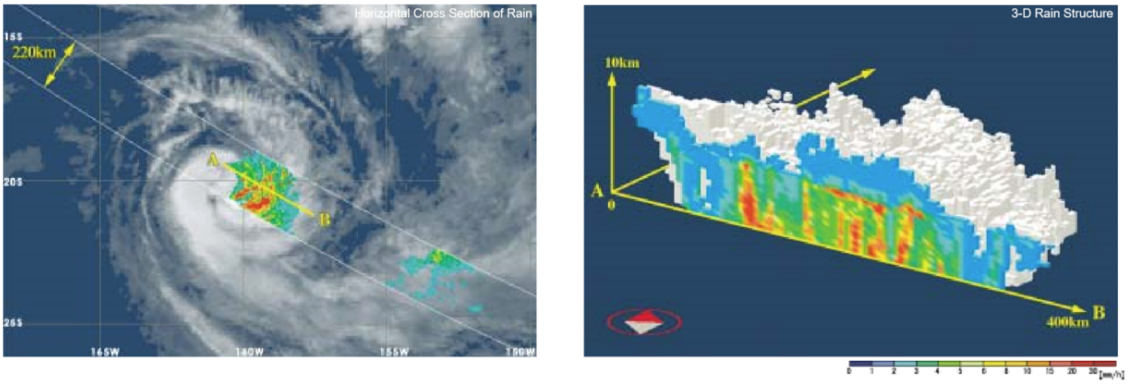

Figure 1: 3D image of precipitation in Cyclone Pam taken by TRMM PR two weeks after the launch (Hiroshima et al. 1998).

The paper describes the progress from the Tropical Rainfall Measuring Mission (TRMM) to the Global Precipitation Measurements (GPM) highlighting Japan's contributions.

- TRMM's main feature is that it carried the first space-borne precipitation radar which enabled the three-dimensional structure of precipitation globally.
- GPM extended the coverage of TRMM to mid- and high-latitude regions.
- The utilizations of the global precipitation maps have widely expanded.