Dropsonde Observations of Intense Typhoons in 2017 and 2018 in the T-PARCII Project

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Typhoon is a tropical cyclone in the western North Pacific and the South China Sea. It is the most devastating weather system in East Asia. Strong winds and heavy rainfalls associated with a typhoon often cause severe disasters in these regions. There are many cases of typhoon disasters even in the recent decades in these regions. Furthermore, future projections of typhoon activity in the western North Pacific show that its maximum intensity will increase with the climate change. However, the historical data of typhoon (best track data) include large uncertainty after the US aircraft reconnaissance of typhoon was terminated in 1987. Another problem is that prediction of typhoon intensity has not been improved for the last few decades. To improve these problems, in situ observations of typhoon using an aircraft are indispensable. The T-PARCII (Tropical cyclone-Pacific Asian Research Campaign for Improvement of Intensity estimations/forecasts) project is aiming to improve estimations and forecasts of typhoon intensity as well as storm track forecasts.

In 2017, the T-PARCII team performed dropsonde observations of intense Typhoon Lan in collaboration with Taiwan DOTSTAR, which was the most intense typhoon in 2017 and caused huge disaster over the central Japan. It was categorized as a supertyphoon by JTWC and as a very intense and huge typhoon by JMA. Typhoon Lan moved northeastward to the east of the Okinawa main island and it was located around 23 N on 21 and 28 N on 22 October. In these two days, we made dropsonde observations at the center of the eye and in the surrounding area of the eyewall. The observations showed that the central pressure of Lan slightly increases from 926 hPa on 21 to 928 hPa on 22 October with the northward movement. On the other hand, The JMA best track data indicate that the central pressure decreases from 935 hPa on 21 to 915 hPa on 22 October. The observations also showed a significant double warm core structure in the eye and the maximum wind speed along the eyewall. The dropsonde data were used for forecast experiments. The result shows an improvement of typhoon track prediction.
The T-PARCII team also made aircraft observations of Typhoon Trami during the period from 25 to 28 September 2018 in collaboration with the SATREPS ULAT group and DOTSTAR. Trami was almost stationary during the period to the south of the Okinawa main island. Then, it moved northward and finally made a landfall over the central part of Japan. This also caused a big disaster and electricity was shut down for several days in the central part of Japan. Typhoon Trami showed a drastic change of intensity from 25 to 26 September with a large change of eye size from about a diameter of 60 km to 200 km. Dropsonde observations showed the change of central pressure and maximum wind speed as well as the thermodynamic structure of the eye.