

RESEARCH PLAN OF THE T-PARCII SECOND PHASE

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ABSTRACT

Although an accurate prediction of typhoon intensity and track is the most important for disaster prevention, a significant uncertainty is present in a typhoon intensity estimation and almost no improvement of intensity forecast has been made in the last decades. Furthermore, rapid intensification makes intensity predictions even more difficult. To solve these problems, in situ observation using an aircraft is necessary. T-PARCII (Tropical cyclone-Pacific Asian Research Campaign for Improvement of Intensity estimations/forecasts) project has been performing in situ aircraft observations of typhoons since 2017. The first phase of T-PARCII ended in 2021 and the second phase that is supported by Grant-in-Aid for Scientific Research (S) has started in July 2021. The objective of the second phase is a mechanism of rapid intensification and thermodynamic structure of concentric eyewalls in addition to accurate measurements and predictions of typhoon intensity.

The jet aircraft, the Gulfstream II of Diamond Air Service Inc. was retired and a new one, the Gulfstream IV (G-IV) has been put into service. Nagoya University supported the installation of the dropsonde launching system of Meisei Electric CO., LTD. on G-IV in August 2021. A test flight for dropsonde launching was made September 7, 2021. Another jet aircraft followed G-IV and watched launching dropsondes at a height of 20,000 ft. G-IV also made another launching test of dropsonde at a height of 40,000 ft. Eight dropsondes were launched from G-IV and all launching were successful.

Using the dropsonde system on G-IV, the team T-PARCII performed observation of Typhoon Mindulle (2021) when it reached around 23 °N to the southeast of the main island of Okinawa on September 29. G-IV took off the Nagoya-Komaki Airport and went down to the south toward the Okinawa region. When G-IV passed over Minami-daito Island, a comparison between dropsonde and balloon-sonde launched from the island was made to verify the accuracy of dropsonde. After the comparison, G-IV approached the eye of Mindulle from the southwest. To observe the inner core region of Mindulle, the butterfly pattern of the flight pass was used with three penetration observations into the eye at a height of 45,000 ft. In this observation, altogether 31 dropsondes were launched in the eye and the surrounding region of the eye. All the dropsonde data were transmitted to Nagoya University in real time. When the observation was made, the concentric eyewall disappeared. However, the central pressure and the maximum wind were observed as well as the warm core structure in the eye. This test observation was promising for aircraft observations of future typhoons.

In 2022, the team T-PARCII will perform aircraft observation of one or two typhoons to the south of Okinawa in collaboration with US and Taiwan. The Ka-band radar has been located in Yonaguni Island and the radar observation will be continued until the end of October 2022. The Nagoya University X-band polarimetric radar will be also installed in Yonaguni Island around the end of March and will make observation until October. The aircraft observation of T-PARCII the second phase is supported by the above fund until 2025 and will be continued until the end of the second phase.

Keywords: typhoon; aircraft observation; dropsonde