

The warm-core structure of Typhoon Mindulle (2021) as observed through the T-PARCII aircraft reconnaissance

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T-PARCII is a Japanese research project of typhoon aircraft reconnaissance to improve the accuracy of typhoon track and intensity prediction. This project uses a new jet aircraft Gulfstream-IV from 2021. This aircraft is characterized by a longer flight time (~8 hours) and a higher flight altitude (~14.4 km) as compared with a previous one. The first reconnaissance flight by this aircraft was carried out for Typhoon Mindulle (2021). For the first time in this project, a "butterfly pattern" flight path was employed in the inner core region. There were 31 dropsondes deployed in this typhoon (5 in the eye, 11 in the eyewall, and 15 on the outside (as shown in the figure)). In this work, characteristics of the observed warm core structure in the eye will be documented. According to estimation by the Japan Meteorological Agency, the central pressure decreased from 950 to 935 hPa within 18 hours including the observation period, implying that we observed this typhoon during a stage of a transition from gradual development to steady state. The 200-850 hPa vertical wind shear in the environment was 6.7 m/s (corresponding to moderate strength) toward east. According to satellite visible images, the diameter of the eye was relatively large, about 80 km in the lower troposphere. These are characteristics similar to those observed previously in Typhoon Lan (2017). The potential temperature anomaly profile was created using dropsondes deployed near the center of the eye. The local maxima of warm anomaly were at an altitude near 3 and 10 km and increasing trend of anomaly with height was observed near the upper troposphere. They manifest a multiple warm-core structure. The equivalent potential temperature reached about 380 K near the sea surface and in the upper troposphere and was as low as 360 K in the lower warm core. These thermodynamic features are also quite similar to those observed in Lan (2017).

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