

Observing System Experiment using T-PARCI dropsondes and JMA Global Forecasting System and Development of Sensitivity Analysis Guidance for Tropical Cyclone Intensity

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Airborne typhoon observations were conducted for Typhoon Lan (2017) under Tropical cyclones-Pacific Asian Research Campaign for Improvement of Intensity estimations/forecasts (T-PARCI). Twenty one dropsonde data including six in the eye of Typhoon Lan were obtained during 05-07 UTC of 21 October 2017. Using the dropsonde data (zonal and meridional winds, temperature, and relative humidity) and the Japan Meteorological Agency Global Spectral Model (JMA/GSM, TL959L100) and 4 Dimensional Variational data assimilation (4DVAR, TL319L100), we performed Observing System Experiment (OSE) to see the impact of the newly available observational data on the track/intensity forecasts by the JMA/GSM. The observation errors for the dropsondes were the same as those used in the operational 4DVAR (same values used for radiosonde and dropsonde). Different from the operational 4DVAR, which includes Quality Control (QC) of assimilated observations, the dropsonde data were forcibly assimilated no matter how large the departures (observation - background) were.

The result of the OSE initiated at 06 UTC of 21 October 2017 showed that the impact of assimilating the dropsondes was little. This would be due to the fact that the track/intensity forecasts of Typhoon Lan by JMA/GSM at this initial time had small errors even without the dropsondes and that there were little room for improvement. In addition, the outer/inner models with a horizontal resolution of 20/60 km, respectively, may have been too coarse as the dropsondes were deployed in and around the TC core.

We developed sensitivity analysis technique for TC intensity using the adjoint model of the 4DVAR. According to the sensitivity analysis guidance targeted at 06 UTC of 21 October 2017, the secondary circulation, especially in the west side of the TC, is found to be sensitive to the future change of the TC intensity. For example, the outflow area at around 200 hPa and 100 - 500 km away from the TC center had large sensitivity. As no observation was available in the sensitivity area, unfortunately the impact of the sensitivity analysis guidance could not be evaluated. This will be a future study.

Keywords: Tropical Cyclone, Aircraft, Observation, Observing System Experiment, Sensitivity Analysis