Diagnosis of Sensitivity of Energy Efficiency in Typhoon Sinlaku(2008) during TCS-08/T-PARC

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In 2008, Typhoon Sinlaku occurred on September 9th. After the weakening stage, it re-intensified from a sheared, asymmetric, weak tropical storm to a typhoon with maximum wind 70kt (36m/s) in southwestern side of Japan.

The evolution of the tropical cyclone (TC) structure was observed by the Naval Research Laboratory (NRL) P-3 aircraft data collected during Tropical Cyclone Structure 2008 (TCS-08) and The Observing System Research and Predictability Experiment (THORPEX) Pacific Asian Regional Campaign (T-PARC) field experiments.

In the previous study, Wayne H. Schubert and Brian D. McNoldy (2010) considered idealized vortex structures and vertical structures of Q that allow the transverse circulation equation to be solved analytically.

However, in this study, the high-resolution aircraft radar and wind data are used directly following Eliassen (1952). We can derive the diagnostic equation for the forced vortexes which contain coefficients A(static stability), B(baroclinity), C(inertial stability) and Q(thermal forcing). Assuming that A is a constant, B and C can be calculated.

After inverting Eliassen transverse circulation equation, we used the temperature data collected from drop sonde soundings that were performed to see the different atmospheric structures between the convective regions associated with the TC center and the principal rain band and the region between them.

Then, we can derive with deriving χ, then the heating efficiency and the dynamical efficiency can be defined considering a basic boundary condition of χ is 0.

As the result, we expect to show the sensitivity of energy efficiency in circulations by using real observed data in 4 different time periods around the convective regions of typhoon Sinlaku in re-intensified stage.