Doppler radar analysis of intensity and inner-core structure of Typhoon Haiyan (2013) near landfall

*Udai Shimada[1], Hisayuki KUBOTA[2], Hiroyuki Yamada[3], Esperanza Cayanan[4], Flaviana Hilario[4]

1. Meteorological Research Institute, 2. Atmosphere and Ocean Research Institute, The University of Tokyo, 3. University of the Ryukyus, 4. Philippine Atmospheric, Geophysical and Astronomical Services Administration

Intensity and inner-core structure of the second most intense tropical cyclone in the world since 1979, Typhoon Haiyan (2013), were examined using ground-based Doppler radar data observed by the Guiuan radar over about 2.5 h immediately before landfall on Leyte Island in the Philippines. The wind fields of Haiyan from 2- to 6-km altitude were retrieved by the ground-based velocity track display (GBVTD) technique from the Doppler velocity data. The GBVTD-retrieved maximum wind speed reached up to 101 m s^{-1} at 4-km altitude on the right side of the track. A relatively fast moving speed of Haiyan, about 11 m s^{-1}, largely contributed to the increase in the maximum wind speed. Azimuthal mean tangential wind increased with height from 2- to 5-km and a local maximum lay at 5-km altitude with a value of 86 m s^{-1}. The central pressure was estimated at 908 hPa with uncertainty of ±5 hPa by using the GBVTD-retrieved tangential wind and by assuming the gradient wind balance. The radius of maximum radar reflectivity was located at about 23-km radius from the center, a few kilometers inside the radius of maximum wind. The reflectivity structure was highly asymmetric at 3-km altitude and above, and was almost axisymmetric below 3-km altitude in the presence of relatively weak vertical shear (~4 m s^{-1}). The axis of the eyewall ring tilted to the downshear direction. In addition, vortex precession with a period of about 75 min was analyzed.

Keywords: tropical cyclone, Doppler radar

