



Wind gusts associated with mesovortices in the inner core of Typhoon GONI (2015)

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The very strong typhoon GONI (2015) passed over the Yaeyama Islands, southwestern Japan, during the rapid intensification stage on 23 August 2015. The typhoon had a clear eye surrounded by the polygonal-shape eyewall. When the eyewall passed through the islands, the record-breaking wind speed of 71.0 m/s was observed and severe wind damage was caused.

The surface observations by the densely distributed weather stations on the Yaeyama Islands revealed unprecedented finescale structure of the core of the typhoon. Strong winds with pressure drop and wind direction change were periodically observed on the passage of the kinks of the polygonal eyewall in the radar reflectivity pattern. Spectral analysis of wind data revealed that about 1000-s period is dominant, which appears to be related to wavenumber-4 vortex Rossby wave. Extreme wind gusts accompanied by sudden pressure drop of about 4 hPa were also observed in the eyewall in a time scale of less than a minute. It is found that extreme wind gusts are caused by the superposition of wind field associated with meso-scale and micro-scale vortices within the eyewall and larger-scale typhoon circulation around the radius of maximum winds. Moreover, observed wind field showed that a number of mesovortices exist in the typhoon's eye.