



## Radar analysis of two tornadoes occurred in the outer rainband of Typhoon 'Neoguri'

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Typhoon is one of major source of tornadoes in Japan. Two tornadoes simultaneously occurred in the Kochi plains when the outer rain band of Typhoon 'Neoguri' passed through there on 10 July 2014. The damaged area due to the eastside tornado was elongated up to 8 km, which is very longer than those of the other damaged area in Japan. We observed them by two polarimetric Doppler radars of Kochi University and the Muroto Doppler radar of Japan Meteorological Agency. In radar analysis, I have used Radar reflectivity, Doppler velocity, KDP data etc. The present study aims to clarify the characteristics of tornadoes and their parent cloud.

Two vortices were first observed at 0600 JST by the Muroto radar and were 30 km offshore from the coastline. They located at the south edge of their parent cloud in the outer rain band. The line echo showing gust front appeared and moved southeastward apart from the parent cloud when it moved northward in the outer rain band. The moving velocity of two vortices was about 28 m/sec. during they were offshore. After their landfall, the westside vortex rapidly slowed down to be 11 m/sec. whereas the eastside vortex kept its speed until 0623 JST and then slowed down. The echo top height of the parent cloud was less than 5000 m at 0621 JST when the vortices landed on the Kochi Plane. This fact shows that the parent cloud was a shallow convective cell in spite of summer season. The height of echo showing gust front and two vortices were about 700 m. We could not find any features of supercell in the parent cloud; hook echo, bounded weak echo region and so on. Generally, the outer rain band of typhoon is major source of supercell in Japan. However, the present tornadoes were classified to be non-supercell tornadoes despite their long lifetime.

We could observe the vortices from 100 m to 700m in height at 0621 JST. The arrangement of vortices was almost parallel and normal to the ground. The diameter and the vorticity of the vortices in the lower layer becomes smaller and larger, respectively.