# WAVELIKE STRUCTURE OF THE RAINBANDS OF A CONCENTRIC EYEWALL TYPHOON REVEALED FROM DOPPLER RADAR OBSERVATIONS

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In a series of recent theoretical and numerical studies, the nature of the rainbands in the inner core region of a tropical cyclone attributed to the vortex Rossby waves are studied extensively. However, there are few studies, from observational point of view, to document the existence of these waves in a real storm. Based on the reflectivity data taken from a Doppler radar located at the southern tip of Taiwan, in this study, we try to analyze the nature of the rainbands of a concentric eyewall typhoon (Lekima 2001) by using Fourier analysis technique. A complete eyewall replacement cycle was observed by this set of data. We have examined the wavelike structure of the rainbands just outside of the radius of maximum wind (30km from the center see Fig.1.) during different stages of the evolution.

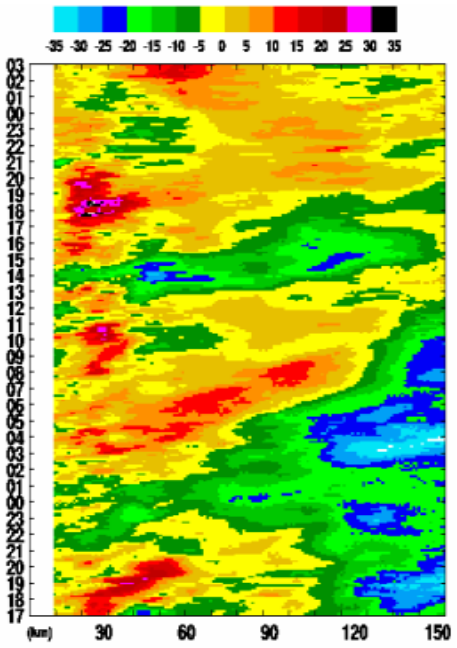


Fig.1. Time-radius section of wavenumber 1 amplitude analyzed from reflectivity data of typhoon Lekima (2001), from 1700LST Sept. 24 to 0300LST Sept. 26, 2001.

It is found that the wavelike structure of the rainbands was dominated by wavenumber 1 disturbance during both the formation and the dissipation stages of the concentric eyewall replacement cycle. However, the propagating speeds and directions are different. During the formation stage, the wave propagated cyclonically and inward to the eye wall with a speed of 8 $ms^{-1}$. Nevertheless, during the dissipating stage, the wave propagated anticyclonically outward with a slower speed, approximately 6 $ms^{-1}$. In its mature stage, the wave activity has been suppressed to a minimum and the axisymmetrical feature dominated.

It is interesting to show the vorticity structure during this replacement cycle and compare with the theoretical study results. The radial velocity data is used to estimate the magnitude and the sign of the axisymmetrical relative vorticity along the radius of the storm. It is found that during the formation stage of the concentric eye wall, there was a secondary maximum value of the relative vorticity existed 15-30 km outside the inner eyewall. This indicates that there is a sign change of the relative vorticity along the radius near the inner radius of the maximum wind. This result provides evidence that there was a favorite condition for the existence of vortex Rossby waves during the formation and also the dissipation stages of the concentric eyewall replacement cycle.

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