In this paper, the Weather Research and Forecasting (WRFV3.1.1) model is used firstly to study typhoon Manyi(2007) during the period of 10th to 13th July 2007. Results show that WRF simulates the track, intensity and spiral bands evolution of Manyi successfully. Then, a typhoon-like vortex is derived from the simulated variables. At last, the 3D vortex perturbation analyzer and simulator (3DVPAS) (Nolan, 2002) is used to study the evolution of a purely thermal, unbalanced perturbations in the vortex environment which is derived from Typhoon Manyi and the interaction between such a typhoon-like vortex and the introduced thermal perturbation.

The vortex is found to be rather unstable, with its fastest growing mode occurring for azimuthal wave number two. The introduced asymmetric temperature perturbations are shown to evolve through fast adjustment and quasi-balance process. The perturbations propagate outward and inward simultaneously at the beginning. The outward perturbations decline gradually, but the inward perturbations are accumulated near eyewall. The evolution of thermal perturbations is accompanied with the evolution of spiral bands. The spatial scale and duration of spiral bands are different if the perturbations are introduced at different radii. With the development of spiral bands, the eddy heat and momentum fluxes are found to propagate outward. The basic-state vortex is intensified and its core becomes warmer with the inward eddy heat and momentum fluxes, whereas the spiral bands begin disappearing. The results may help us to understand the effect of latent heat release on typhoon spiral rain (cloud) bands.