Sensitivity of Numerical Simulation of Typhoon Nepartak (2016) to Cloud Condensation Nuclei Concentration

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The study is carried out using the WRF model and the Cloud Condensation Nuclei, CCN, in the WDM6 microphysics scheme has been modified to test its impacts on typhoon simulations. The simulated track, intensity, and rainfall distribution of Typhoon Nepartak (2016) over Pacific Ocean are compared among numerical experiments of different initial concentration of CCN (wdm6_ctr, wdm6_10, and wdm6_50, where wdm6_10 and wdm6_50 represent that CCN are respectively 10 and 50 times of the value used in wdm6_ctr).

The simulated tracks in three runs are similar, but the intensity and the maximum dBz increase both in wdm6_10 and wdm6_50, but it takes more time for wdm6_50 to intensify. The comparison of mixing ratios of five water species shows that the cloud droplets mixing ratios increase as CCN is increased. The mixing ratios of rain, cloud ice, snow and graupel are enhanced more rapidly in wdm6_10 compared with wdm6_50. The same situation happens in the divergence field and upward motions. It is suggested that the increase of CCN will result in stronger typhoon, but the intensification will be slowed down with too much CCN.

Keywords: Cloud Condensation Nuclei, Typhoon Nepartak, Microphysics Scheme