STRUCTURAL EVOLUTION OF THE GENESIS AND DEVELOPMENT ON MESO-β VORTEX FOR THE "98.7" HEAVY RAINFALL: SIMULATION OF TWO WAY WITH QUARTET NESTED GRID

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Abstract

An extraordinary heavy rainfall in Wuhan periphery of the east Hubei on 20-22 July 1998 ("98.7") has successful simulated for 36 hours using MM5.V3 with full moist physics and two way with quartet nest grid as well as FDDA of analysis nudging. The results pronouncedly improved previous simulation of the two- and triple- nest grid, especially, the nest subdomain D04 with 2km horizontal resolution was able to simulate more correct heavy rainfall area and raininess, further revealed the structures and evolution of the genesis and development on meso-β systems producing intense heavy rainfall. The main results include: (1) The intense development of a meso-β shear line over low level along the Changjiang River in the east Hubei and the occurrence of a convergence center were in directly relationship with the genesis and development on a meso-β low vortex; (2) The structural vertically features of the intense development on the meso-β shear line showed that the intense convergence and divergence layers were reiteration and coupling development with intense ascending motion, while the intense vorticity and potential vorticity as well as convergence layers were interadjoint, the moist potential temperature center in low levels and the saturated vapor belt in middle levels were coexistence; (3) The structural vertically features of the genesis on the meso-β low vortex indicated that the divergence and ascending motion emerged double branches column development, the vorticity and potential vorticity emerged one branch column development, the high moist energy column emerged double branches coupling development, the moisture channel emerged step slantwise ascending; (4) The structural vertically features of the development on the meso-β low vortex showed that the V letter typical columns of the divergence and ascending motion emerged intercoupling development, the vorticity and potential vorticity were double branch column, the double branch high moist energy column intensely developed, the step slantwise ascending moisture channel changed into wide and deep. Up to this stage the development of the low vortex reached the most intension, while this structure was possessed of the typicality. The simulative results also indicated that the development of a multiple nest technology with high temporal and spatial resolution and the application of FDDA method will be helpful to understand in more detail the structure and evolution of the genesis and development on the meso-β severe convective systems, while it will further enhance predictive capability for heavy rainfall area and raininess.

Key words: **Heavy rainfall, Meso-β vortex, Structural evolution, FDDA of analysis nudging, Two way with quartet nest, Numerical simulation.**