Evolution of the low-level mesocyclone in a mini supercell

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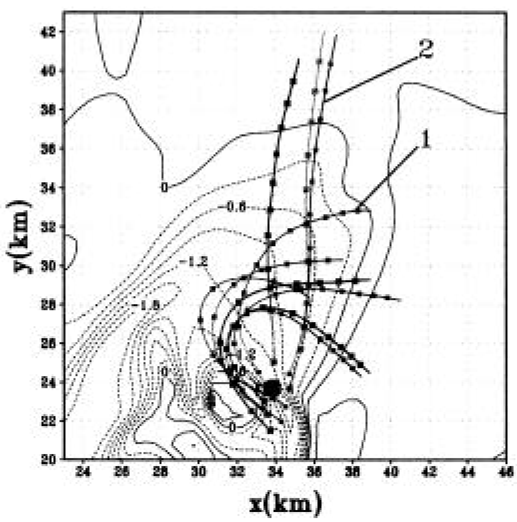
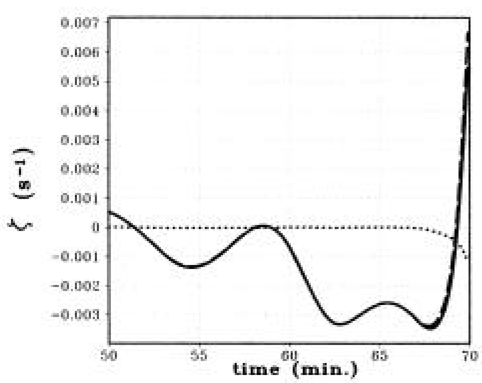
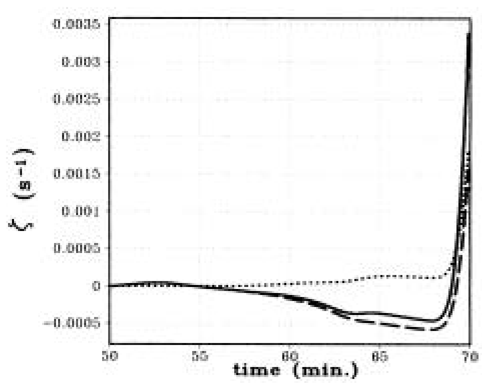
The formation mechanisum of a low-level mesocyclone(MC) in a supercell storm remains still controversial. A study is made on a well reproduced mini-supercell storm which spawned F2 tornado in the Kanto plain on 19 September 1990. A vorticity budget study on 20 minutes backward trajectories of particles placed in the low-level MC of the mature storm reveals that most of the particles come from 1km AGL between north and east of the MC. The vertical vorticity of the MC is found to be produced through downward tilting of horizontal vorticity associated with vertical shear of the environmental wind at 1km AGL, subsequent horizontal and upward tilting, and finally, vertical stretching.



第 1 図: t=70 に高度 175m の MC (大きな黒丸) の周りに置いた 10 個の粒子の 20 分間のバック・トラジェクトリー (2 分毎に四角の点で示す)。等値線は高度 25m における 0.3K 毎の温位偏差。





第 2 図 (左): 粒子 1 についての鉛直渦度 ζ の時間変化。渦度方程式において、傾圧項を含む場合 (実線)、傾圧項を含まない場合 (破線)、傾圧項を含むが t=50 における初期の渦度を 0 とおいた場合 (点線)。第 3 図 (右): 第 2 図と同じ。ただし粒子 2 について。