A Numerical Simulation of Squall Lines

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ABSTRACT

The Regional Atmospheric Modeling System (RAMS), equipped with a full set of cloud microphysical parameterization, was used to simulate squall lines. In contrast to the previous studies, a large domain was used hence eliminated non-physical disturbance from boundaries. The general features of model storms have replicated the basic multi-cellular character and airflow, typical of squall lines. The intensity of physical fields developed by the model storms appeared to be reasonable. In addition, we examined the extended horizontal vorticity balance theory of Weisman (1992). Our results suggest that the primary contribution of horizontal vorticity owes its origin from the environmental vertical wind shear. While examining the relationship between the propagation speed of the squall lines and the environmental low-level wind shear, we found that squall lines move faster in the full-ice experiment than that without ice phase. The differences between the wake low produced by our model simulation and observations were also compared.

Key words : Squall line, Horizontal vorticity balance, Wake low