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High-Resolution, Rapid-Scan Dual-Doppler Retrievals of Vertical Velocity in a Simulated Supercell

Abstract

Observation system simulation experiments (OSSEs) are widely used to do different dual-Doppler analysis (DDA). In this study, utilize the high-resolution Advanced Regional Prediction System (ARPS) to simulate a tornadic supercell in Oklahoma City and evaluate different dual-Doppler analysis techniques for retrieving vertical velocity from rapid-scan radar.

Variational approaches with and without a vertical vorticity equation constraint and traditional method involving vertical integration of the mass conservation equation are tested. The analyses use radar data simulated at different locations, positioned at 15, 30, and 45 kilometers to the east of the tornadic supercell, with scan intervals ranging from 10 to 150 seconds. Besides, the impact of removing observations below 1 kilometer from the surface is also examined in some analyses. However, at longer radar distances and without the data of scarcity, the results of traditional method similar to the variational method, and it is much less expensive to implement. And at close range and with data denial, the variational method is much more accurate. This shows the additional of vorticity constraint can improve the variational analysis.

Keyword

Variational Method

Reference

Dahl, N. A., A. Shapiro, C. K. Potvin, A. Theisen, J. G. Gebauer, A. D. Schenkman, and M. Xue, 2019: High-Resolution, Rapid-Scan Dual-Doppler Retrievals of Vertical Velocity in a Simulated Supercell. *Journal of Atmospheric and Oceanic Technology*, **36**, 1477–1500.