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Improving the retrieved vertical velocity in WISSDOM by radial wind equations

Abstract

Vertical velocity is important in severe weather system, and it's also useful to understand the mesoscale dynamics of the atmosphere. There is no measurement can directly observe the vertical velocity in high spatial and temporal resolution. However, WISSDOM (Wind Synthesis System using Doppler Measurements) can use variational method to convert radial wind data into three-dimensional wind field. But in previous research have pointed that retrieved vertical velocity is not as well as horizontal wind. So, this study aims to improve the retrieved vertical velocity by three radial wind equations.

In this study, the data used is observation system simulation experiments (OSSEs). The result indicated that using three radial wind equations to retrieve vertical velocity is very accurate. And make this correct vertical velocity information as a new weak constraint in WISSDOM to be retrieved. Compare to without new weak constraint experiment, the experiment with new weak constraint can retrieve vertical velocity well in all domain. Moreover, the wind information in three radar coverage areas can affect outward about 3km in horizontal direction. It also can affect upward and downward about 4km in vertical direction.

Keyword
Variational Method