

# 利用觀測系統模擬實驗評估同化邊界層垂直剖線觀測對 模式定量降水預報之效益

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## 摘 要

本研究利用WRFDA中的三維變分資料同化執行觀測系統模擬實驗(Observation System Simulation Experiment, OSSE)，同化由模式資料模擬的地面站觀測、雷達觀測以及邊界層垂直剖線觀測。挑選三種不同的天氣個案，包含午後對流、鋒面降雨以及晴空環流，評估增設風場、溫度以及水氣垂直剖線觀測在不同天氣情境下，對於定量降水預報的影響。結果顯示在午後對流與鋒面降雨兩組個案中，相較於同化風場的垂直剖線觀測，同化溫度以及水氣等熱力變數的垂直剖線觀測能夠更有效的改善降雨預報的表現。在晴空環流這類沒有降雨的個案中，同化水氣的垂直剖線觀測並沒有明顯的效益，而同化風場的垂直剖線觀測可以更精準的掌握環流結構，並且能夠改善模式的弱風預報表現。

關鍵字：三維變分、觀測系統模擬實驗

# **Assimilate Planetary Boundary Layer Vertical Profilers in Observation System Simulation Experiments: Impacts on the Quantitative Precipitation Forecast**

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## **Abstract**

This study employs the 3-dimensional variational (3DVar) method in WRFDA to conduct the observation system simulation experiment (OSSE), assimilating surface observations, radar observations, and planetary boundary layer (PBL) vertical profilers simulated by model outputs. Three different cases, including an afternoon thunderstorm, moving front, and clear air circulation, are selected to evaluate the impacts on the quantitative precipitation forecast (QPF) resulting from assimilating PBL vertical profilers. The results illustrate that assimilating temperature and water vapor profilers improve the performance of the QPF more significant than assimilating wind profilers. With no precipitation in the clear air case, assimilating water vapor profilers does not have obvious benefits, but assimilating wind profilers can better capture the circulation structure and improve the performance of the wind forecast.

Keywords: 3DVar, Observation System Simulation Experiment