# Assimilation of Wind Profiling Radar Data in GRAPES-MESO Model System

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Based on observational datasets of the wind profiling radars (WPR) in China during July 2015, a two-step quality control procedure for the WPR data is developed. Firstly, we start from the five-beam radial velocity, and recalculate the horizontal winds. After a series of processes including the spatial consistency check, time consistency averaging and vertical wind shear check, the hourly-resolution wind datasets were finally generated with quality indicator (QI) labels. We then use the ECMWF reanalysis data and radiosonde data to evaluate the newly generated WPR data. Results show that the method used for the QI labeling performs well. When its value is greater than 50, the root mean square error of u and v components are 2.29m/s and 2.37m/s respectively. This is consistent with previous research conclusions, and confirms the reliability of the pre-processing algorithm. Secondly, a second−round quality control based on the data assimilation is conducted. This procedure includes (1) removing the wind filed data located below the GRAPES model terrain, (2) configuring the effective height, (3) background check and (4) vertical thinning. The distributions of the innovations corresponding to observations after the QC are more close to a Gaussian distribution. The WPR observations after the QC were used in one-month continuous experiments based on the GRAPES modeling system. Results show that the assimilation of wind profiling radar data can effectively improve the wind state in the initial conditions. The corresponding 0-24h forecast of wind performs better. An analysis of 6-hourly verification scores like ETS and BIAS of the precipitation field suggests that the assimilation of wind profiling radar data makes a positive contribution to the rainfall forecast, especially in the short−range forecasting within 12 hours. The impact of assimilating WPR data on the case of typhoon “Linfa” is also investigated in this study. Results show that assimilating WPR data can effectively adjust the dynamic structure and water vapor conditions over the typhoon precipitation area, forming more favorable conditions for development of convective system and improving the forecast skill of precipitation.

Keywords: Wind profiling radar, Quality control, GRAPES-3DVAR, Impact experiment