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3D-Var Assimilation of TRMM Rain Rate and Its Impact on the Typhoon Dujuan (0313) forecast

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The GRAPES 3D-VAR assimilation system has been released by Chinese Academy of Meteorological Sciences. This study uses the extension of the KUO cumulus parameter scheme as the observation operator to assimilate the TRMM rain rate on the GRAPES 3D-VAR system. Single observation tests show that this algorithm can adjust the vertical background structure of the moisture convergence depending on the difference between the observation operator calculation and the TRMM rain rate. After the assimilation, the observation operator can obtain more accurate rain rate using the analysis field. In the experiment of forecasting typhoon Dujuan (0313), the assimilation algorithm can adjust the dynamic and thermodynamic structure of the background field and obtain more realistic wind and precipitation structure. Compared with the control test, assimilating TRMM rain rate can improve the typhoon Dujuan's track and precipitation forecast.

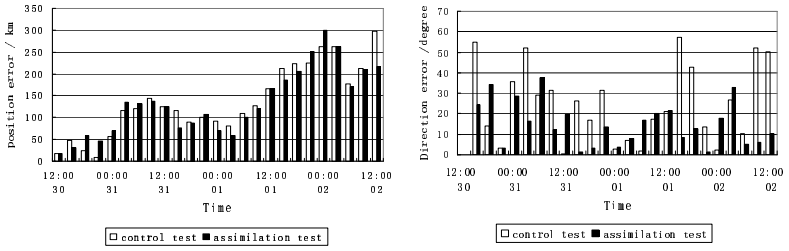

Figure 1 & 2: Typhoon DUJUAN's forecast error in control test and assimilation test.
Figure 1: position error; Figure 2: direction error