

# 國立中央大學大氣物理研究所書報討論

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## **Applying Variational Bias Correction to Surface Data with a Convective-scale Data Assimilation System**

### **Abstract**

Significant biases exist between near-surface observation and model simulation outputs, posing a major challenge in assimilating surface data effectively. Therefore, this study was inspired by the well-established variational bias correction (VarBC) method commonly used in satellite data assimilation. The VarBC method is extended to the surface data assimilation and implemented in a WRF/WRFDA-based convective-scale data assimilation system at the CWA-RWRF to assimilate dense surface observations in Taiwan. Utilizing the statistical relationship between innovations and multiple predictor variables in the bias model of VarBC, adaptive bias correction is achieved during assimilation.

The impact of the VarBC on surface data assimilation is investigated with a Meiyu front-related heavy rainfall events from 6 to 8 June 2022, and the afternoon convection case on 22 to 23 July 2019. A set of VarBC models is introduced for assimilating 10-meter wind, 2-meter temperature, and 2-meter humidity observations, while radar observation data are also assimilated. Results indicate that the use of the VarBC reduces the mean errors in the analysis and forecast fields, with particularly significant improvements in water vapor, and can improve the temperature difference caused by the model and observation altitude, and also have a positive impact on the wind field and rainfall forecast.