對流尺度系集預報系統研發：初始場擾動之測試評估

賴曉薇、蘇奕叡、李志昕、洪景山

氣象資訊中心,

中央氣象局

摘 要

基於模式對於快速演變的非線性天氣系統其可預報度低，實務上，一方面藉由快速更新的資料同化系統來改善初始條件以提升模式預報準確性，另一方面也藉由系集預報系統來量化預報的不確定性。然而針對對流尺度天氣的系集預報系統，因其預報有效時間短，系統藉由物理擾動而成長的離散度不足以對應模式誤差的成長，初始場即具備足夠並合理的離散度是系統能否掌握天氣系統不確定性的必要條件。

中央氣象局使用 32 組成員的局地系集轉置卡爾濾波系統（LETKF）來同化雷達及地面資料，其中 16 組分析場提供對流尺度系集預報系統（convective-scale ensembles predict system, CEPS）做為初始條件，進行 12 小時預報。因同化的分析過程有效的修正背景場以貼近觀測，同時也降低了成員的離散度。本研究進行全循環的預報，是在背景場加入三維變分同化（雷達及地面資料）的分析場以不同截斷長度的進行混合更新，未來將持續進行在 LETKF 分析場上應用膨脹法的預報，評估其對於預報離散度的影響。

The Study of Convective scale ensemble forecast system: Initial condition uncertainty

Hsiao-Wei Lai, Yi-Jui Su, Chih-Hsin Li and Jing-Shan Hong

Meteorological Information Center,

Central Weather Bureau

Abstract

The predictability of rapidly evolving convection weather system prediction is low due to the nonlinear error growth of the model. In practice, the rapid update of the data assimilation system is adapted to improve the initial conditions and benefit to the accuracy of the model forecast. On the other hand, the ensemble forecast system is used to quantify the uncertainty of the forecast. However, for the convective-scale ensemble forecasting system, due to its short forecast time, the dispersion growth due to physical uncertainty is not enough to correspond to the error growth of the model. It is necessary for the initial condition to have sufficient and reasonable dispersion.

We adapt 16 members from LETKF (Local Ensemble Transform Kalman Filter) 32 member analysis which assimilate radar and surface observation data hourly, as initial condition to conduct a Convective-Scale Ensembles Predict System (CEPS). And the 12-hour forecasts are performed. The DA analysis effectively corrects the background field to get closer to the observation, and time reduces the dispersion of members simultaneously. The full-cycle forecast in this study is to blend a 3DVar DA analysis field as a large scale constrain to the background field with different cutoff-lengths. In the future, the application of the inflation method on the LETKF analysis field will continue to be carried out. We will evaluate theirs impact on dispersion relationship.