1. INTRODUCTION

- Backgrounds: Variational Echo Tracking (VET) in MAPLE
  - Since the scaling-guessing method uses one initial guess as a constant, it is difficult to estimate the motion vector in the beam blockage or weak echo area.
  - The accuracy of the motion vector directly affects prediction accuracy of MAPLE.
  - McGill Algorithm for Precipitation nowcasting by Lagrangian Extrapolation (MAPLE)

- Purposes: Improvements of motion vectors in VET
  - In order to improve the quality of motion vectors of VET, initial guess correct by using analysis field of numerical model and Doppler radar wind field.

2. DATA

- Radar Reflectivity field
  - CMAX(column max) of reflectivity (10 KMA radars)
  - HSR(Hybrid Surface Radar) of reflectivity
- Korea Local Analysis and Prediction System (KLAPS)
- Analysis wind field of numerical model: 700 hPa

3. METHODOLOGY

- Correction of initial guess
  - The motion vectors are calculated over 25x25 sub-area using a constant as initial guess by scaling-guessing method.
  - A motion vector at each grid is then derived by bilinear interpolation using the 25x25 motion vector to apply the semi-Lagrangian advection.
  - We applied 700 hPa wind field of KLAPS instead of a constant as initial guess of VET.

4. CASE STUDY

- 3h forecast reflectivity field from MAPLE (Summer season)
  - CASE1: 24 May, 2016 09:20 LST, CASE2: 15 July, 2016 20:00 LST
  - Underestimation of motion vectors according to beam blockage and ground echo
  - Correction of initial guess of VET using KLAPS

5. VERIFICATION

- Improved MAPLE Skill scores according to correction of motion vector
  - Period: 1 May ~ 31 Oct, 2016 (6 months)
  - CSI score (+1h, +2h, +3h, +4h, +5h, +6h)
    - MAPLE: 0.60, 0.44, 0.36, 0.29, 0.22, 0.18
    - MAPLE (Correction): 0.64, 0.53, 0.44, 0.38, 0.31, 0.26
    - Improvement rate(%): 6.7, 20.5, 22.2, 31, 40.9, 44.4

6. SUMMARY

- Correction of initial guess of VET using wind fields of KLAPS solved the problem of underestimation of motion vectors in the beam blockage and ground echo area.
- As a result of applying the improved motion vector to semi-Lagrangian advection, prediction accuracy of MAPLE was improved by 22% for 3-h forecast and the distortion of the precipitation shape is also reduced.

REFERENCES


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