9.6 IMPROVED RAINFALL NOWCASTING BY NON-STATIONARY MOTION VECTOR FROM BURGERS EQUATION

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Major limitations in radar-based rainfall nowcasting are 1) growth/decay and 2) non-stationarity of advection. In this work, we propose an advection diffusion equation to smooth forecast field for different lead time. Motion vectors are updated at each time by solving a system of two dimensional (2D) Burgers′ equations to take into account non-stationarity of motion vectors to improve advection of rainfield. The initial motion vector field is first derived by variational echo tracking (VET) algorithm. The time dependent advection or advection diffusion equation is solved alone or with 2D Burgers′ equation. Forecasts are then generated at each time step by solving these equations. Finally, these new forecasts are compared with the Lagrangian extrapolation scheme (MAPLE). The high-resolution forecasts are generated every 2.5 min up to 3 h for 6 rainfall events over 250 x 250 km area in southeastern Korea. To examine the effects of diffusion term and non-stationary motion vectors (obtained from Burgers′ equation), we generated four types of forecasts: advection equation (Type 1), advection equation with Burgers′ equation (Type 2), advection diffusion equation (Type 3), and advection diffusion equation with Burgers′ equation (Type 4). The forecasts from the Type 1 method was very similar as the ones of MAPLE. The other models (Type 2-4) clearly have better skill scores and correlations compared with MAPLE up to lead time of 3h on average. In addition, the non-stationary motion vectors significantly improve the forecast skill.