Geophysical Research Abstracts,
Vol. 11, EGU2009-11473, 2009
EGU General Assembly 2009

Seamless Probabilistic Forecasting of Convective Storms

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Different methods are used to provide forecasts of precipitation with different lead times, and a major challenge is to provide seamless forecasts across the range of times of interest to a decision maker. Firstly, the detailed precipitation map obtained from Radar can be extrapolated into the future by advecting the precipitation pattern ("Nowcasting"), although the forecast quality degrades rapidly in the first hours because the dynamics of the storm are not accurately represented. At longer lead times numerical weather prediction ("NWP") is superior since it includes dynamical effects, but cannot match the skill of nowcasting in the first few hours due to the difficulty of assimilating precipitation observations. A seamless combination of these methods requires knowledge of their errors, and is difficult because the predictability depends strongly on the meteorological situation. However it is now becoming possible with the availability of probabilistic predictions from ensembles of high resolution forecasts.

These concepts will be illustrated using ensemble forecasts of convective events with the 2.8 km resolution COSMO-DE model nested within different forecasts from the COSMO-LEPS ensemble. Probabilistic nowcasts are produced using the Cb-TRAM system that tracks convective a convective cloud field using an optical flow method. The images are then extrapolated forward in time and probabilistic forecasts are generated using the local Lagrangian method. Examples will be shown to illustrate how the forecast skill of the two methods is influenced by the inherent predictability of the meteorological situation, in particular the degree of control of convective by the synoptic flow.