Study of Doppler Weather Radar 3D Mosaic Data in Strong Convective Weather Forecasting and Early Warning

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Lighting, gale, tornadoes and heavy rainfall caused by strong convective system are among the main weather types generating meteorological disasters. This study developed an Short-Term Weather Forecast System to monitor and predict lightning, wind, hail and precipitation within 2 hours in China with a temporal resolution of 1 minute and spatial resolution of 1 km. The system is developed based on the 31-layer jigsaw grid products generated by Doppler weather radar data , by using the image identification technology, machine learning algorithm, and multi-thread parallel computing method. Compared to the previous linear extrapolation algorithm or the simple image identification technique, the new method could predict the growth of convection monomer more accurately by combining the vertical gradient, the horizontal texture and the optical flow field information of the radar reflectivity with the deep neural network, It also improves the period of validity and prediction accuracy of strong convective weather by using the cloud classification and vertical gradient of radar reflectivity to recognition lightening and hail. In addition, the quantitative precipitation estimates and forecast product could provide more accurate prediction of position and intensity of short-term heavy rainfall by fitting of Z-R relationship with ground precipitation observations and re-correction of optimal interpolation. The method improves monitoring and forecasting ability of rainfall for regions without observations. The validations are conducted for different cases and all of them show good performance .