Assessment of satellite rainfall nowcasting based on extrapolation technique

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Background

• The National Meteorological Satellite Center (NMSC)/Korea Meteorological Agency (KMA) produce extrapolated images based on satellite data for nowcasting
• The satellite imagery prediction technique includes EXIM (Extrapolated Imagery) and MAPLE (McGill Algorithm for Precipitation Nowcasting and Lagrangian Extrapolation)
• Vector optimization was performed to improve accuracy of extrapolation of rainfall intensity using MAPLE and EXIM

Result

MAPLE (McGill Algorithm for Precipitation Nowcasting and Lagrangian Extrapolation)

- The motion field of a cloud is determined by the VET (Variational Echo Tracking)
- Expressing the movement of clouds through Semi-Lagrangian Scheme.

EXIM (Extrapolated Imagery)

- Extrapolation of the features most prominently reflected in the individual channels, and in turn to discard displacement vectors stemming from other layers
- For each pixel, extrapolate to the AMV, and for the second step, move to the AMV in the new position
- Different methods are applied depending on the type of image that extrapolates

Methodology

- Both MAPLE and EXIM use vectors generated from the infrared channels to extrapolate the rainfall intensity
- In some cases, the movement of clouds and the movement of rain are different.
- Optimize the prediction using water vapor vectors to predict the movement of precipitation.

Limits to Prediction

- The extrapolation method has limitations that cannot predict the developing or dying clouds
- Since the movement of clouds and precipitation cell is different, a new method is needed to express the movement of rainfall intensity
- WV vector, not the IR vector, was used to extrapolate the rainfall intensity
- The extrapolation prediction method is difficult to predict for developing and disappearing clouds

Summary

- The extrapolation method has limitations that cannot predict the developing or dying clouds

Reference

• ZAMG/NWCSAF, 2017: Algorithm Theoretical Basis Document for the Extrapolated Imagery Processor of the NWC/GEO
• Urs Germann and Izstarr Zawadzki. 2002: Scale-Dependence of the Predictability of Precipitation from Continental Radar Images. Part I: Description of the Methodology

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