Post-Processing of Canadian Regional-Scale NWP Data to Develop First-Guess Forecasts of Thunderstorm and Severe Weather Threat Areas


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1. Introduction

- In a Next-Generation forecast system, EC forecasters will modify area-based "First-Guess" (FG) forecasts to generate meteorological products for FGS and short-range NWP guidance in Environment Canada (EC). The Regional Operational Prediction System (RDPS) is an 10-km horizontal grid spacing (upgraded from 25 km in Jan 2012).

2. Data and Methods

- RDPS data and observed CLDN lightning data are used to calibrate post-processed NWP output over a selected domain via the following process:
  - MUCIN 
  - Integrated VV (AVV, MUCIN)
  - RUDD [not shown]

3. Forecast Verification

- A search area of 60 x 60 km was used to determine if lightning (T=0 to 59:59) was associated with the forecasted threat areas using the 15-km RDPS grid products shown for comparison. For comparison, the 15-km RDPS Threat Area (T+1) forecast was used.

4. Calibrated Forecasts

- Seasonal Calibration (May 30 Sep 2013)
  - Hourly probability thresholds determined from deciles averaged over the entire 153-day period from the previous thunderstorm season

- Running Calibration (based on previous 5, 10, or 20 days in 2014)
  - Hourly probability thresholds based on the selected calibration period between 1 May and 30 September 2014

5. Forecast Verification

- A search area of 60 x 60 km was used to determine if lightning (T=0 to 59:59) was associated with the forecasted threat areas using the 15-km RDPS grid products shown for comparison. For comparison, the 15-km RDPS Threat Area (T+1) forecast was used.

6. Severe Weather Areas

- As a post-processing step, a 3% probability forecast threat areas from previous seasonal calibration using the 15-km RDPS were coupled with several well-known severe weather parameters (thresholds shown below) to highlight FG severe weather threat areas based on the NWP-based "storm environment."

7. Summary

- Subjective (not shown) and objective verification of calibrated forecasts suggested some utility as a starting point for the human forecaster.
  - Limited overall skill may preclude use as automated forecasts at this time.
  - FG forecasts were used to identify severe weather threat areas that compare well with actual watches issued by forecasters.

Data from a regional-scale, deterministic, NWP model can provide a useful starting point for forecasters-modified thunderstorm and severe weather forecasts.