Evolution of Mesoscale Ingredients

Methodology

Average Evolution Plots

- Choose 10 latitude and longitude pairs across the band at a time before it begins to dissipate
- Using 20-km RUC data and gages and plots to find the value of frontogenesis and EPV at each point for every hour
- Average the values for each hour to arrive at an average evolution of the mesoscale ingredients

Log Correlations

- Lag correlations were calculated to determine any significance to the lag time of EPV reductions relative to the frontogenesis peak
- The frontogenesis peak is assigned a time of T=0
- Time periods of EPV values were named according the lag before or after the frontogenesis peak: T-4, T-3, T-2, T=0, T+3, T+6
- Histograms of the correlation values were created to determine significance
- Hypothesis test for linear correlation: 20 cases of freedom 90%, 95%, 99% confidence intervals were calculated

Conclusions

- The evolution of frontogenesis and EPV of 15 case studies revealed a consistent pattern in the evolution where EPV and frontogenesis were correlated and EPV reductions occurred at lag times T-6, T-4, T-2, T-1, T+4, T+6 relative to the frontogenesis peak
- There is a tendency for a case to exhibit more EPV reductions if EPV minimizes before frontogenesis starts to increase
- Preference for negative correlations and EPV reductions occurred at lag times T-1, T-2, T-3, T+4, T+6 relative to the frontogenesis peak

The Problem

- We have a basic understanding of the ingredients responsible for mesoscale snowbands. But questions remain about the evolution of the ingredients relative to the snowband life cycle.

Background

- The conveyor belts create an environment conducive to heavy-banded snow northwest of the surface low pressure center
- EPV is used to indicate areas conducive to the release of CSI

Hypothesis

- Two positive feedbacks related to the positive feedback mechanism before a snowband intensifies
  1. A sharp increase in frontogenesis just before EPV is reduced
  2. A sharp increase in frontogenesis after EPV is reduced
- Alternative hypothesis: the positive feedback is not taking place and the reduction in EPV and increase in frontogenesis is not correlated