Comparison of AMPS MM5 and AMPS WRF Forecasts Using Self-Organizing Maps

John J. Cassano and Mark W. Seefeldt

University of Colorado
Cooperative Institute for Research in Environmental Sciences
Department of Atmospheric and Oceanic Sciences
Project Goals (Part 1)

• Develop SLP synoptic climatology based on AMPS output
• Evaluate AMPS forecasts from a “synoptic” perspective
• Work completed to date
  – Compare MM5 AMPS and WRF AMPS forecasts
  – Evaluate changes in frequency of forecast synoptic patterns as a function of forecast duration
  – Calculate percent of time that predicted synoptic pattern matches what was observed
  – Identify misprediction of synoptic patterns
Data for SOM Analysis

• SLP over Ross Sea sector of AMPS 20 km model domain
• Data from both MM5 and WRF AMPS simulations
• Use forecasts from 2007 and 2008 field seasons
  – 1904 model valid times
  – 11424 forecasts from each model
  – 22848 total forecasts
• Evaluate forecasts at 12h intervals
  – 000: 0, 3, 6, 9 h
  – 012: 12, 15, 18, 21 h
  – 024: 24, 27, 30, 33 h
  – 036: 36, 39, 42, 45 h
  – 048: 48, 51, 54, 57 h
  – 060: 60, 63, 66, 69 h
Ross Ice Shelf SLP Synoptic Climatology: WRF AMPS

WRF node frequencies all
Comparison of WRF AMPS and MM5 AMPS Forecasts
WRF AMPS vs MM5 AMPS Forecasts: All Times

-28%  -18%  -17%  -28%

-12%  -22%

-16%

+13%  +29%

+20%  +15%  +19%  +25%

All node frequencies WRF-MM5
WRF AMPS vs MM5 AMPS Forecasts (060)

-33%

+34%

+35%

+36%
Changes in Frequency of Forecast Synoptic Patterns as a Function of Forecast Duration
WRF AMPS: 012 vs 000 Forecasts

-32%  -26%  -32%  -39%  -37%

-0.48 -0.47  0.48  0.05 -0.10 -0.21

-0.21  0.31 -1.10 -0.90  0.73  1.05

+61%  +49%  +30%  +65%  +58%  +52%

WRF node frequencies 012–000
WRF AMPS: 060 vs 000 Forecasts

WRF node frequencies 060–000
Percent of Time Forecast Synoptic Pattern Matches Observed Synoptic Pattern
Percent of Time Forecast Patterns Match Obs: 012

WRF corr 012–000
Percent of Time Forecast Patterns Match Obs: 060
Misprediction of Synoptic Patterns
Misprediction of Synoptic Patterns: 060
Misprediction of Synoptic Patterns: 060
Project Goals (Part 2): Future Work

- Determine model errors for different synoptic patterns based on comparison with AWS obs
- Implement real-time SOM verification of AMPS:
  - SLP pattern identification
  - Misprediction of SLP patterns
- Develop “forecaster guide” to model errors
- Relate SOM model analysis to forecaster identified model errors