AVN-Based MOS Precipitation Type Forecasts

Rebecca L. Allen

Techniques Development Laboratory
Office of Systems Development
NWS
AVN Precipitation Type Guidance

The probability that a specific precipitation type will occur given that precipitation occurs at that station.

- Forecasts valid every 3 hours from 6 to 72 hours
- Available for 1000+ sites in the CONUS and Alaska
Precipitation Types

**Frozen**
- Pure Snow
- Snow Grains

**Liquid**
- Rain
- Drizzle
- Rain/Snow Mixed Thunderstorms

**Freezing**
- Freezing Rain
- Freezing Drizzle
- Ice Pellets

Anything Mixed with Freezing Rain/Drizzle, or Ice Pellets
MOS Technique

Statistically relates observed weather elements to appropriate predictors.
Statistical Particulars

- Multiple Linear Regression
  - Forward selection
  - Enhanced non-linear predictors

- Regional Equations
Ptype Development Regions

4 Regional Equations
**Predictors**

**AVN Model**
- Temperature
- Wetbulb Temperature
- Thicknesses
- U & V Winds
- Temperature Advection
- Relative Humidity

**ZR Predictor**
- SSR Predictors

**Geoclimatic**
- Latitude
- Longitude
- Elevation
- Relative Frequencies
- Sin/Cos DOY

**Observed**
- Temperature
- Avg of Temp and Dew Point
- snow/no snow
- rain/no rain
- freezing/no freezing

*Blue text indicates predictor was often selected by regression routine*
ZR Predictor

- Cold temperature at surface
- Inversion aloft within temperature bounds
- Model predicts precipitation
Developmental Sample

- 611 stations judged to report reliably

- 2 Years of Data:
  - Sep 16 - May 15 of 97/98, 98/99
  - Model data from 00z cycle

- Conditional - only cases where precip occurred
Verification

"Is it any good?"

- P-Score
  - Mean-squared error of probability forecasts
  - Compare with NGM MOS Ptype and climatology

- Independent Sample
  - ~ 400 stations
  - 88 days: Last 15 days Oct 98 - Mar 99
Overall Ptype P-scores

~400 stations, 98/99

% Improvement Over Climate

Projection

12 hr 24 hr 36 hr 48 hr 60 hr 72 hr

NGM AVN
<table>
<thead>
<tr>
<th>NGM Ptype</th>
<th>AVN Ptype</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temporary Challenges</strong></td>
<td><strong>Temporary Challenges</strong></td>
</tr>
<tr>
<td>12 vertical levels</td>
<td>5 vertical levels</td>
</tr>
<tr>
<td>5 years of data</td>
<td>2 years of data</td>
</tr>
<tr>
<td>Logit predictors</td>
<td>SSR predictors</td>
</tr>
<tr>
<td><strong>Long Term Advantages</strong></td>
<td><strong>Long Term Advantages</strong></td>
</tr>
<tr>
<td>Data every 6 hours</td>
<td>Data every 3 hours</td>
</tr>
<tr>
<td>No model data beyond 48 hours</td>
<td>Model data out through 72 hours</td>
</tr>
<tr>
<td>190.5 km horiz. resolution</td>
<td>95.25 km horiz. resolution</td>
</tr>
<tr>
<td>2 cycles per day</td>
<td>4 cycles per day</td>
</tr>
<tr>
<td>565 sites</td>
<td>1000 + sites</td>
</tr>
<tr>
<td>SAO obs</td>
<td>METAR/ASOS obs</td>
</tr>
</tbody>
</table>
Conclusions & Future Work

- AVN Ptype skillfull; not as accurate as NGM yet
- Scheduled implementation February 2000

- Categorical forecasts
- Develop other cycles (06Z, 12Z, 18Z)
- Redevelop equations with larger sample
- MRF Ptype system - Oct 2000
- Eta Ptype system - Oct 2001
TDL Website

Http://nws.noaa.gov/tdl/synop