
MRF- Based MOS Precipitation Type Forecasts

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MRF Precipitation Type Guidance

The probability that a specific precipitation type will occur during a 12-hr period given that precipitation occurs at a station

- Probabilistic forecasts for each of the precipitation types
- Categorical forecast derived from the probabilities
- Forecasts valid every 12 hours from 24 to 192 hours after the 0000 UTC MRF model run
- Available for approximately 1000 sites in the CONUS and AK

Precipitation Types

- ***Freezing (Z)***

- ▶ freezing rain, freezing drizzle, ice pellets, anything mixed with freezing rain/drizzle or ice pellets

- ***Frozen (S)***

- ▶ snow or snow grains

- ***Liquid (R)***

- ▶ rain, drizzle, or thunderstorms

- ***Rain/Snow Mix (RS)***

- ▶ rain/snow mixed at an hour OR pure rain and pure snow both occur during the 12 hour period
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Predictand Definition

Medium Range Precipitation Type

- Up to 13 hourly observations from a 12-hr period are classified as 1 of the 4 mutually exclusive precipitation types
 - A minimum of 7 reports must be sent in and 3 of those must be precipitation
 - The mixed types of Z and RS do not distinguish between mixed at an hour versus mixed over the 12 hours (i.e. A report of RAPL versus separate hours of RA and PL)
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Predictors

MRF Model

Temperature
Wetbulb Temperature
Thicknesses
Wind
Temperature Advection
Freezing Level
Relative Vorticity
Vertical Velocity
ZR Predictor
Transformed Predictors

Geoclimatic

Relative Frequencies
Sine DOY
Cosine DOY

Observed

Temperature
Dewpoint
Avg of Temp and Dew Point
frozen/no frozen
liquid/no liquid
freezing/no freezing

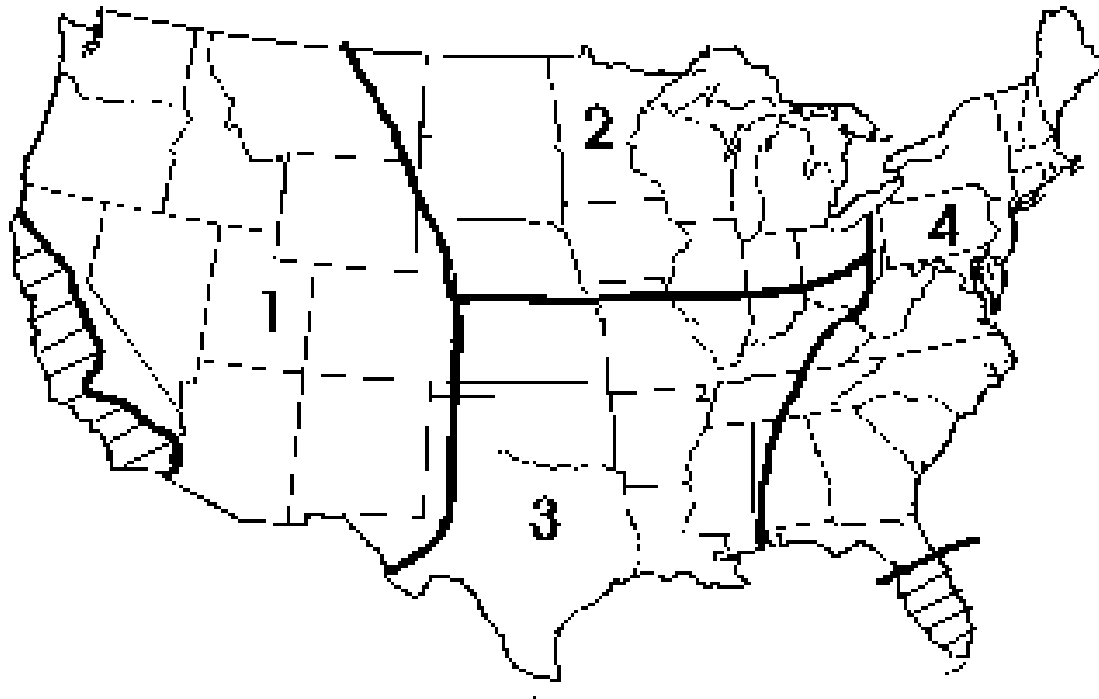
Model predictors were offered at the beginning and end of the 12-hr period, as well as averaged over the 12-hr period.

Developmental Sample

- 705 stations judged to *report reliably*
 - ▶ Divided into 6 regions
 - **Approximately 4 years of data:**
 - ▶ Sept - May of 97/98, 98/99, 99/00
 - ▶ MRF Reanalysis data available every 5th day from Sept - May of 92/93, 93/94, 94/95, 95/96, 96/97
 - **Conditional - only cases where precip occurred are included**
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Ptype Development Regions

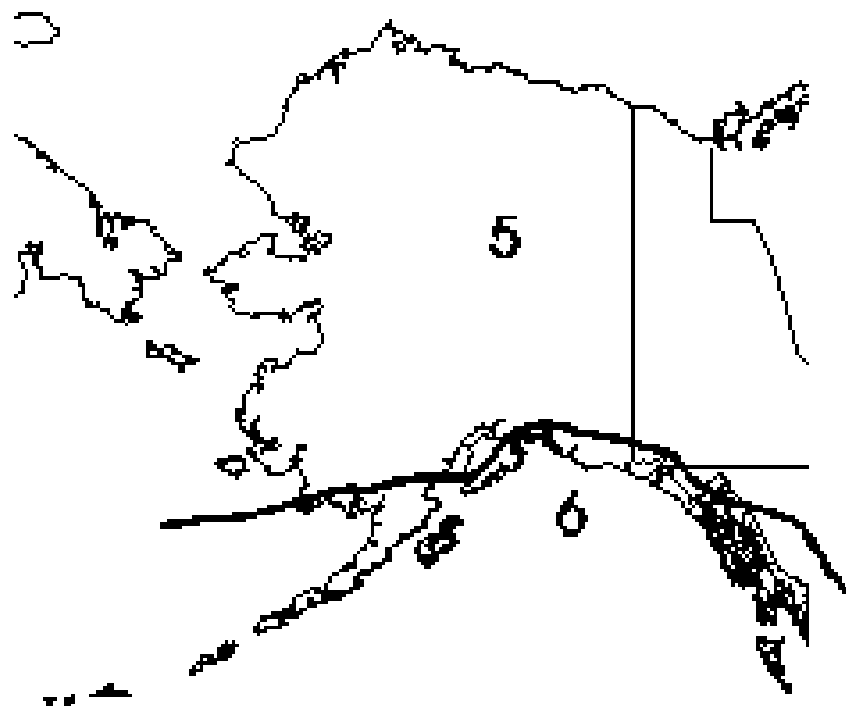
4 Regional Equations for the CONUS



* forecasts will not be produced for stations in the hatched areas

Ptype Development Regions

2 Regional Equations for Alaska

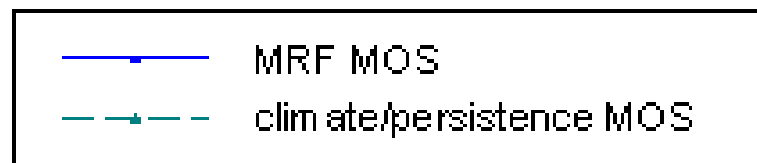
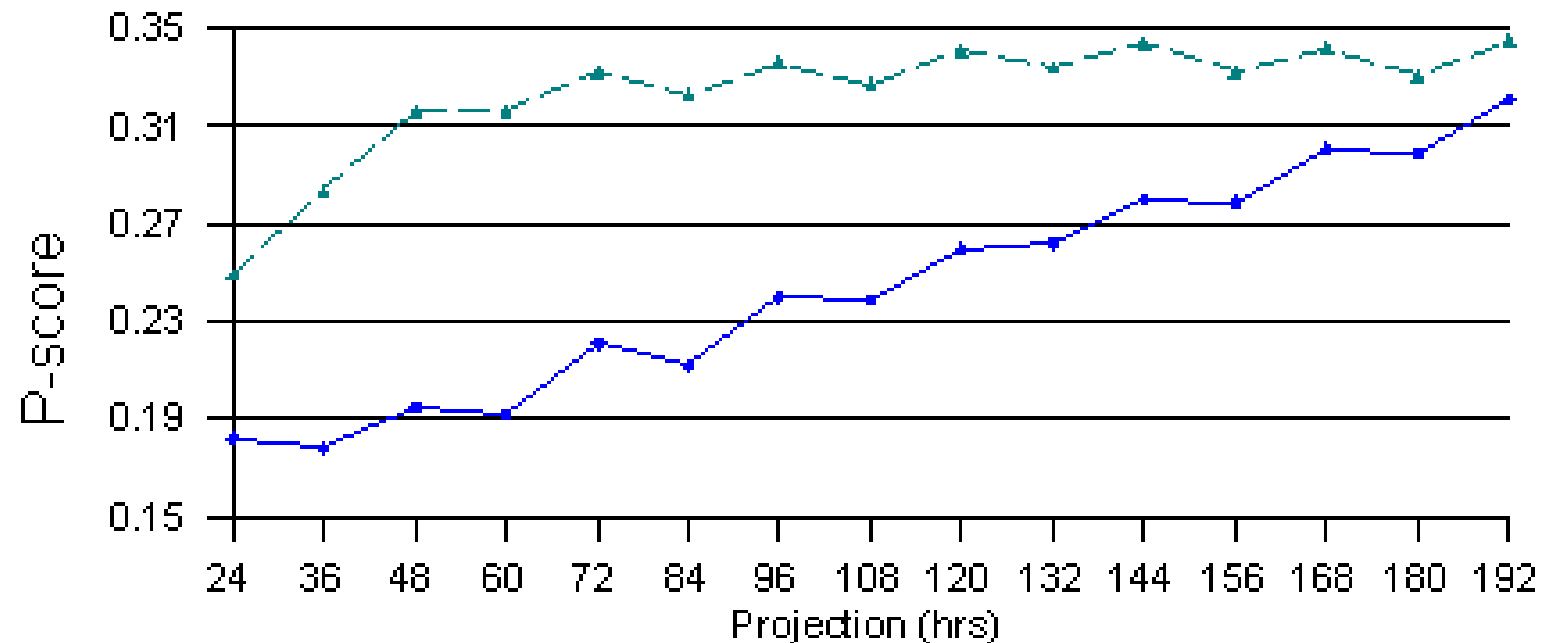


Verification

Test equations were derived using 3 of the 4 years of developmental data. Resulting forecasts were verified for the 99/00 season.

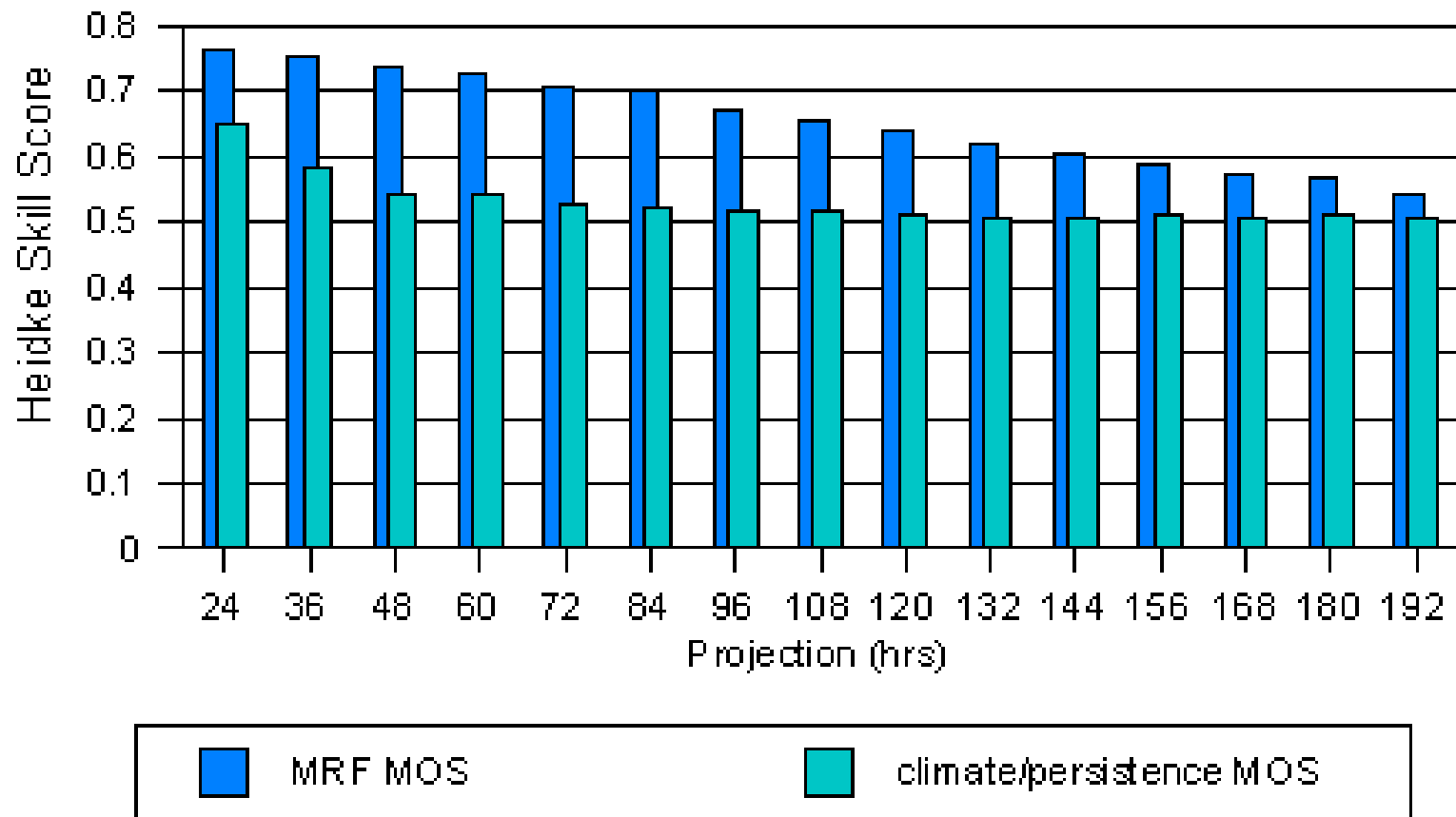
- **P-scores for probabilistic forecasts**
 - ▶ Mean-squared error of forecasts
 - ▶ Smaller values represent more accurate forecasts
 - **Heidke Skill Scores for categorical forecasts**
 - ▶ Larger values represent more skillful forecasts
 - **MRF MOS forecasts compared to reference forecasts generated using only observed and climatological predictors**
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MRF MOS Probability Forecasts



Independent data: Sept. 1999 - May 2000
705 stations in CONUS & AK

MRF MOS Categorical Forecasts



Independent data: Sept. 1999 - May 2000
705 stations in CONUS & AK

Conclusions

- New MRF MOS system provides more detailed precipitation type forecasts for more stations
 - Developmental testing shows the MRF MOS ptype guidance is more skillful than a system based on climatology and persistence at all projections
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