Gridded Localized Aviation MOS Program (LAMP) Guidance for Aviation Forecasting

Judy E. Ghirardelli and Bob Glahn

National Weather Service
Meteorological Development Laboratory

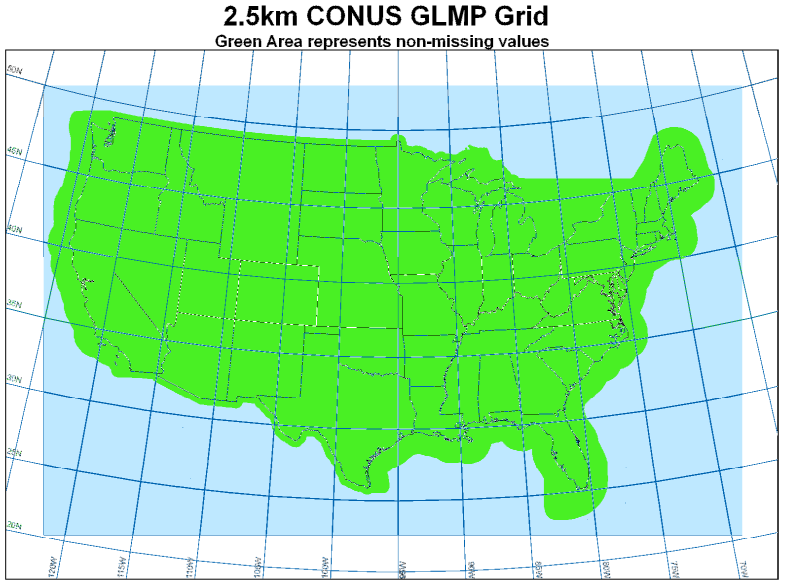
August 2, 2011

15th Conference on
Aviation, Range, and Aerospace Meteorology
Los Angeles, CA

LAMP/Gridded LAMP (GLMP)

- LAMP:
  - Guidance of sensible weather at stations
  - Guidance of thunderstorms (≥ 1 CTG lightning strike) on grid

- GLMP: Gridded observations and Gridded LAMP forecasts of:
  - Temperature
  - Dewpoint
  - Ceiling Height (100's of ft)
  - Visibility (miles)
  - Other elements later



- Status:
  - GLMP running experimentally at NCEP as of 9/28/2010, will be operational 9/27/2011
  - Data available in Experimental NDGD
  - Available in MDL's test Web Coverage Service
  - Exp. GLMP grids can be brought into AWIPS via the LDM data feed
  - Can be used in the creation of NWS digital aviation products
  - Images available on LAMP web page
  - Will be available via the NextGen 4-D Data Cube

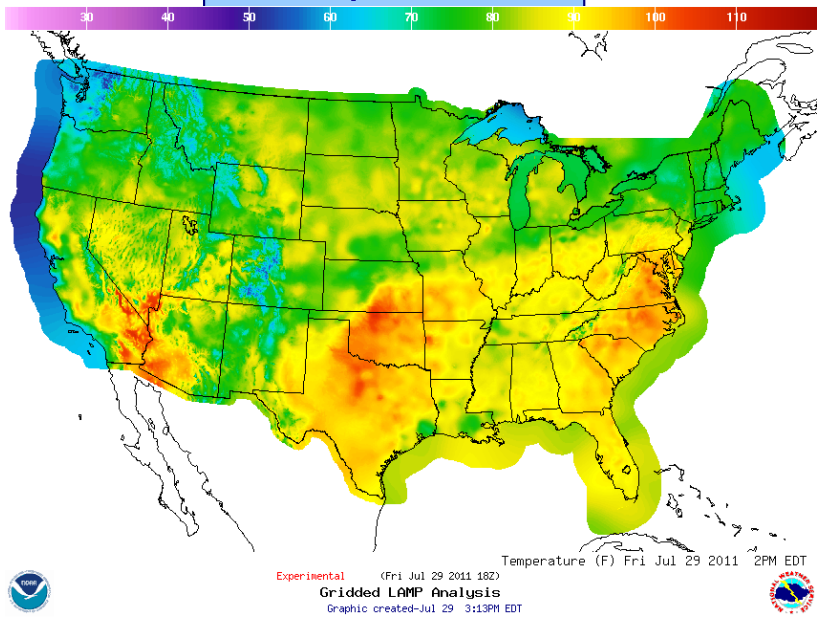
Gridded LAMP Details

- Gridded LAMP analyses of observations – for checkout and verification
  - Temperature and Dewpoint:
    - Observations from METAR, Mesonet, synoptic stations, C-MAN, tide gauges, and moored buoys (Roughly 10,000 – 12,000 observations per hour)
    - Error estimates of temperature and dewpoint available in gridded format
  - Ceiling Height and Visibility:
    - Observations from METAR
- Gridded Analysis of LAMP forecasts
  - Temperature and dewpoint:
    - Continuous values are analyzed
    - < 1500 LAMP stations (input points) in CONUS, so SREF forecasts are used to augment LAMP forecasts
  - Ceiling Height and Visibility:
    - Categorical values are converted to continuous values
    - No augmentation

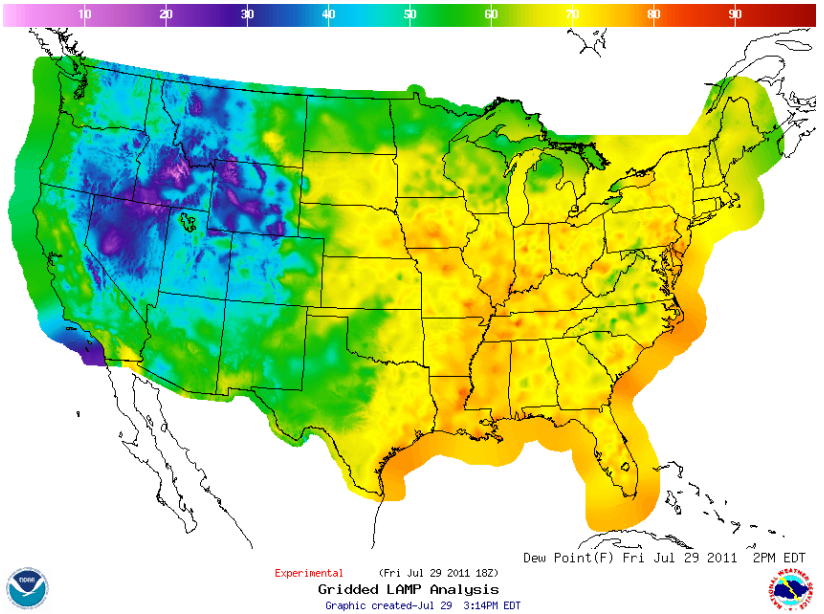
Technique: MDL Gridding Technique used in Gridded MOS, with modifications

Gridded LAMP: 0-25 hours

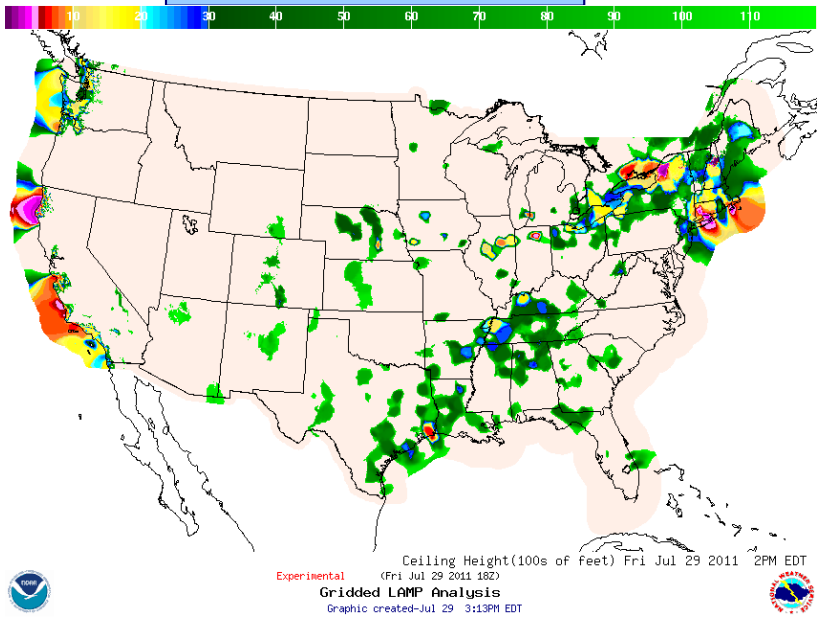
Temperature



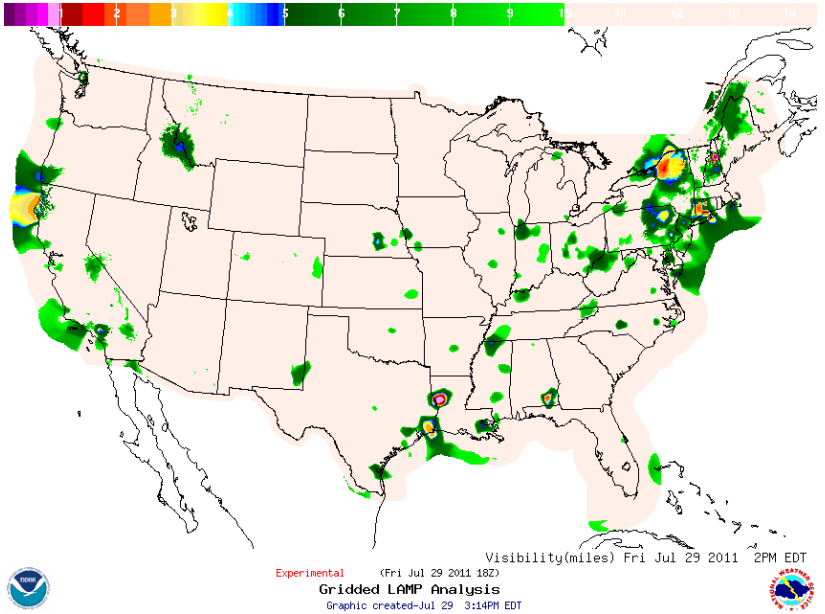
Dewpoint



Ceiling Height



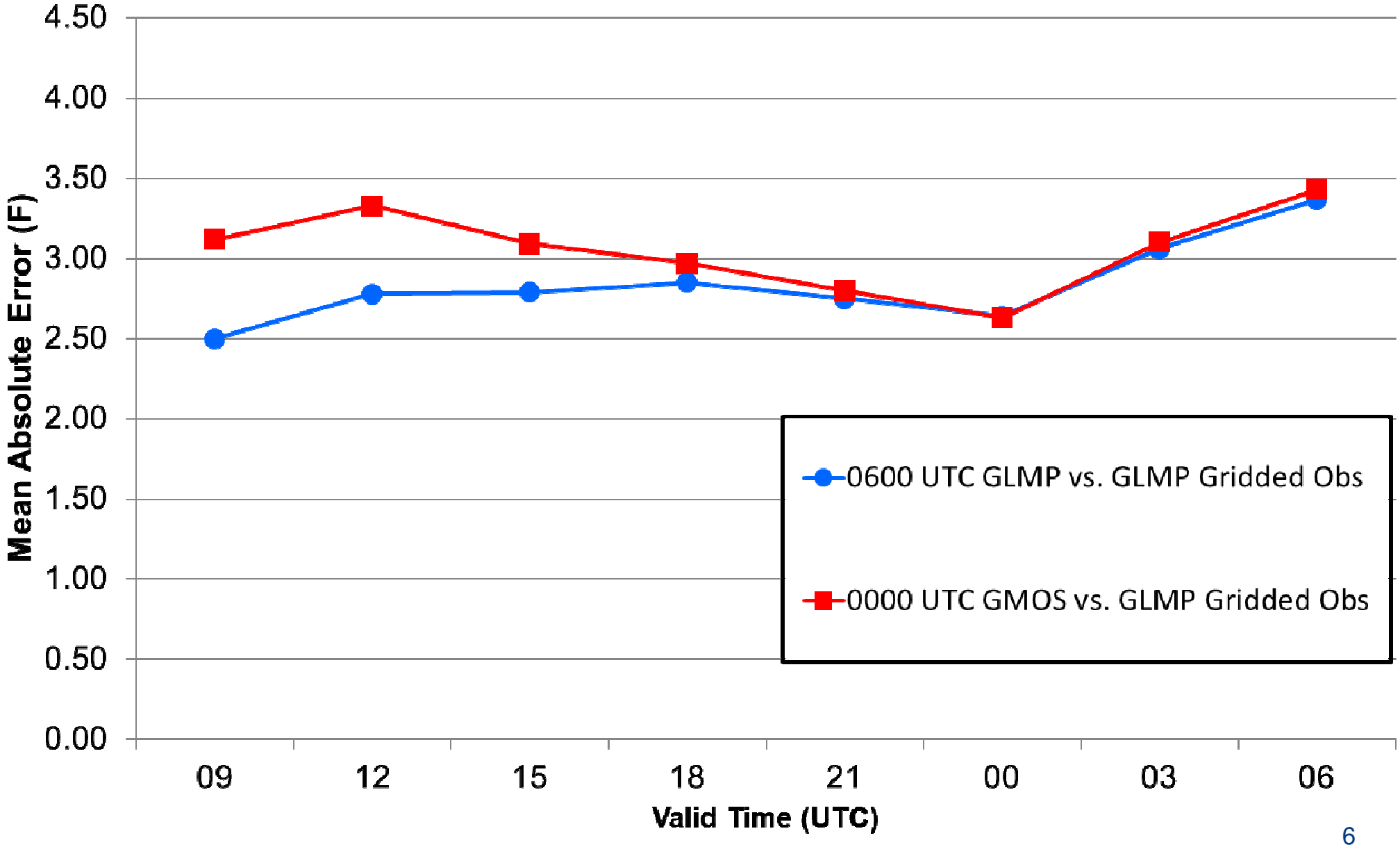
Visibility



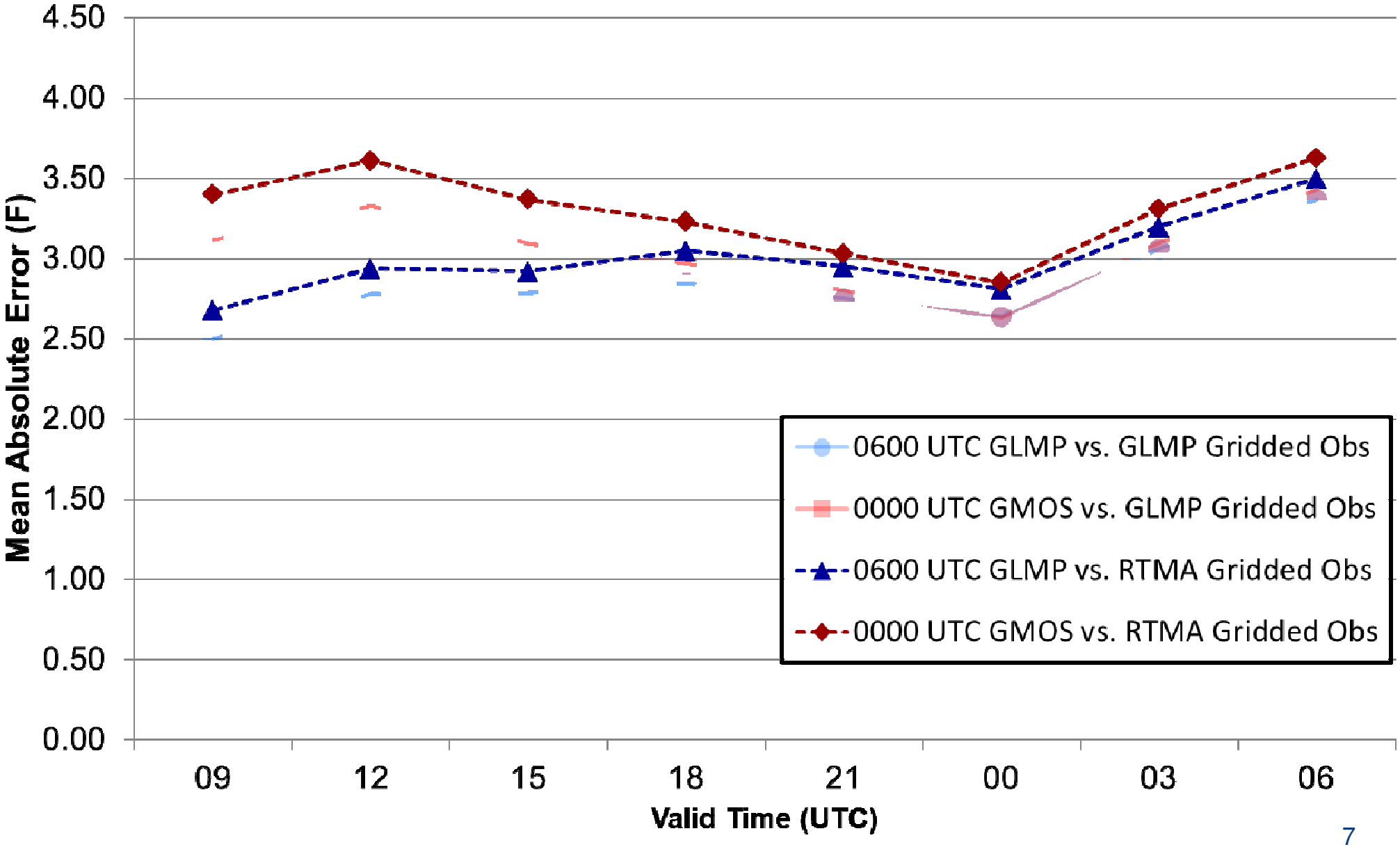
Temperature and Dewpoint Gridded Verification

- Compared GLMP vs. GMOS
  - 0600 UTC GLMP vs 0000 UTC GMOS
  - 1800 UTC GLMP vs 1200 UTC GMOS (in paper)
- Data Sample: November-December 2010
- Area: CONUS, 2.5-km grid
- Variables: Temperature (Dewpoint results shown in paper)
- Verification using two methods:
  - GLMP 0-hr gridded observations
  - RTMA
- Computed:
  - MAE over all gridpoints
  - Fractional Improvement in MAE of GLMP over GMOS at each gridpoint
- Purpose: to determine if GLMP improves on GMOS as LAMP improves on MOS

MAE over all gridpoints
0600 UTC Gridded LAMP Verification
Temperature - All Regions

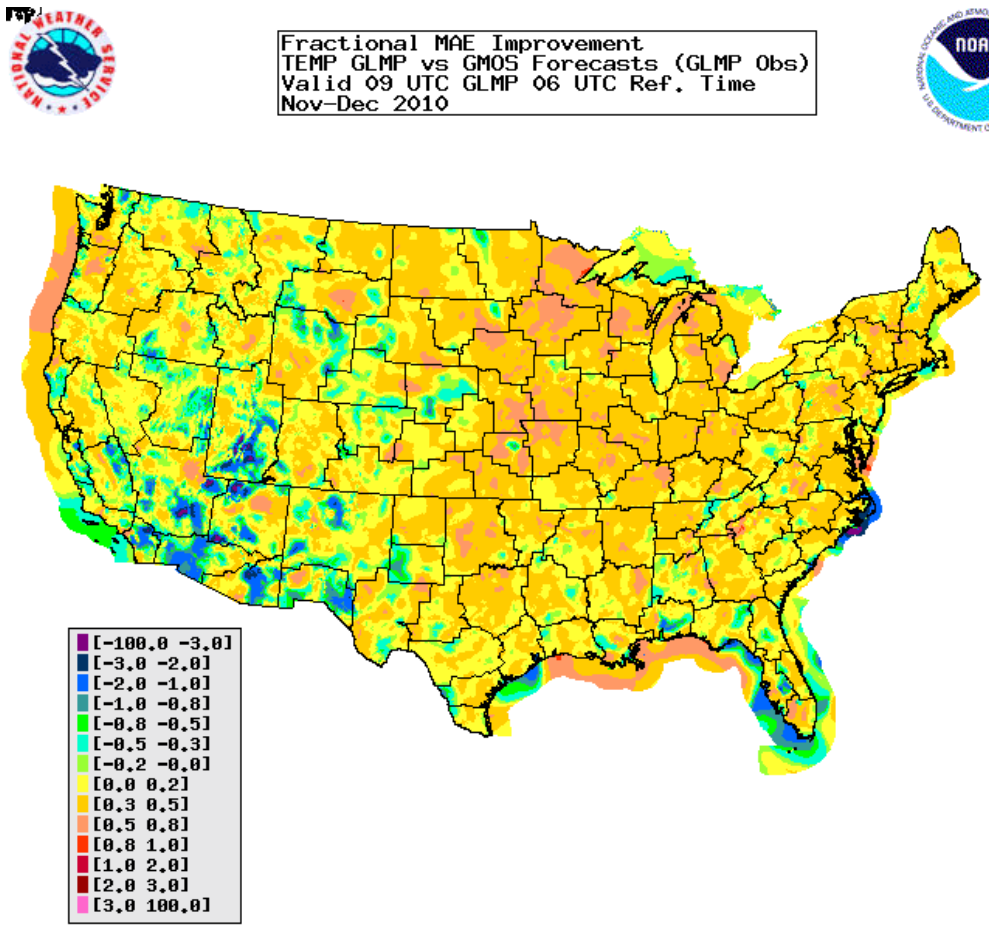


MAE over all gridpoints
0600 UTC Gridded LAMP Verification
Temperature - All Regions

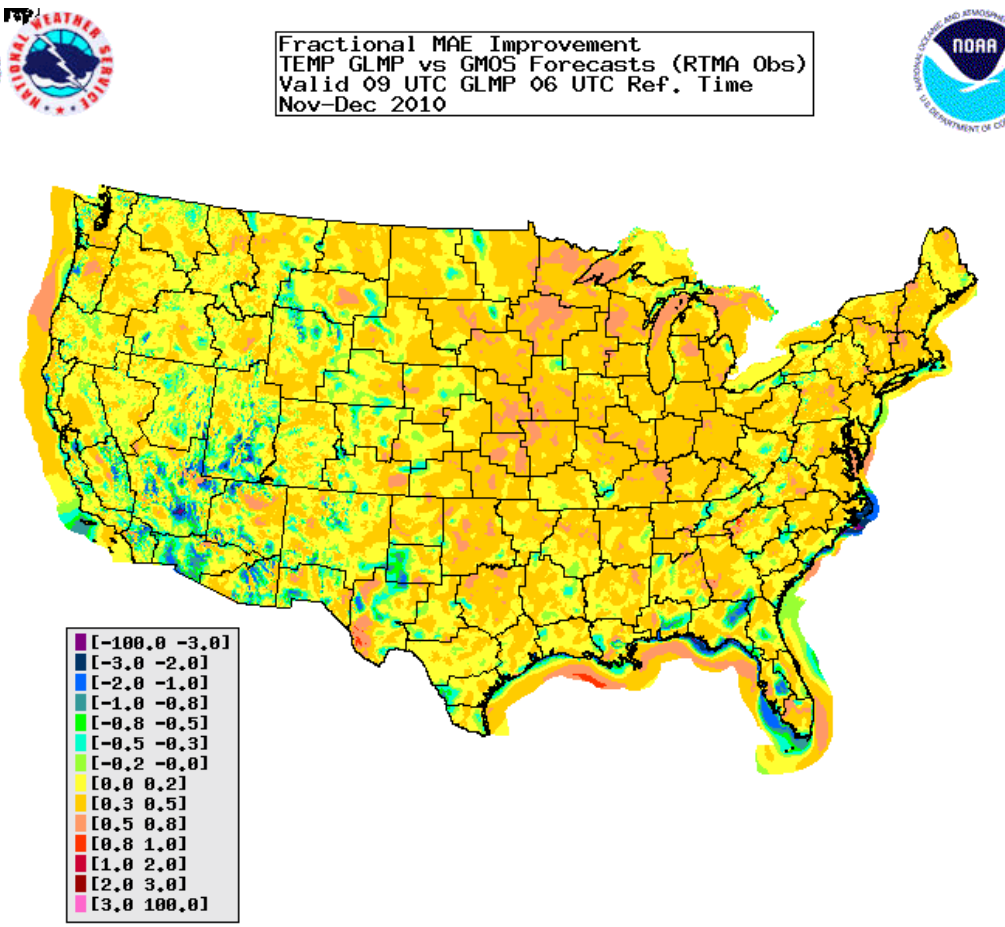


Fractional improvement in MAE of GLMP over GMOS at gridpoints

(3-hr forecast from 0600 UTC GLMP)



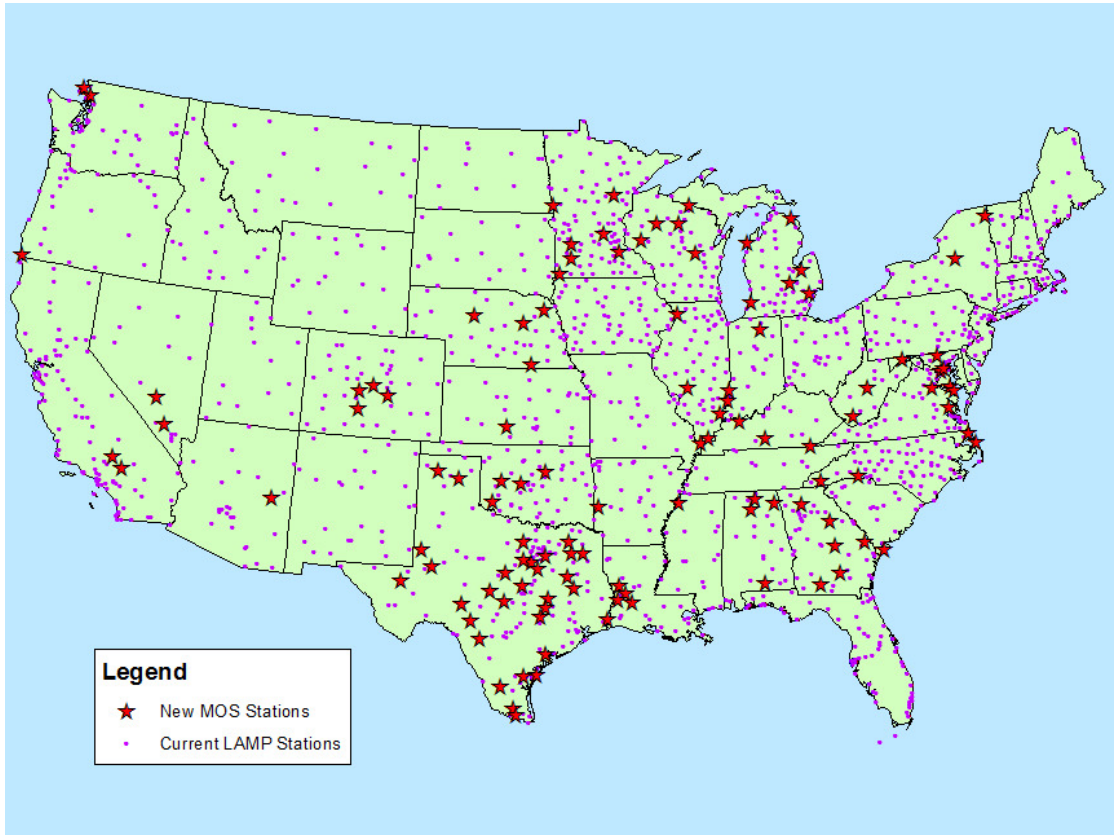
GLMP Temperature
Verified w/ 0-hr GLMP



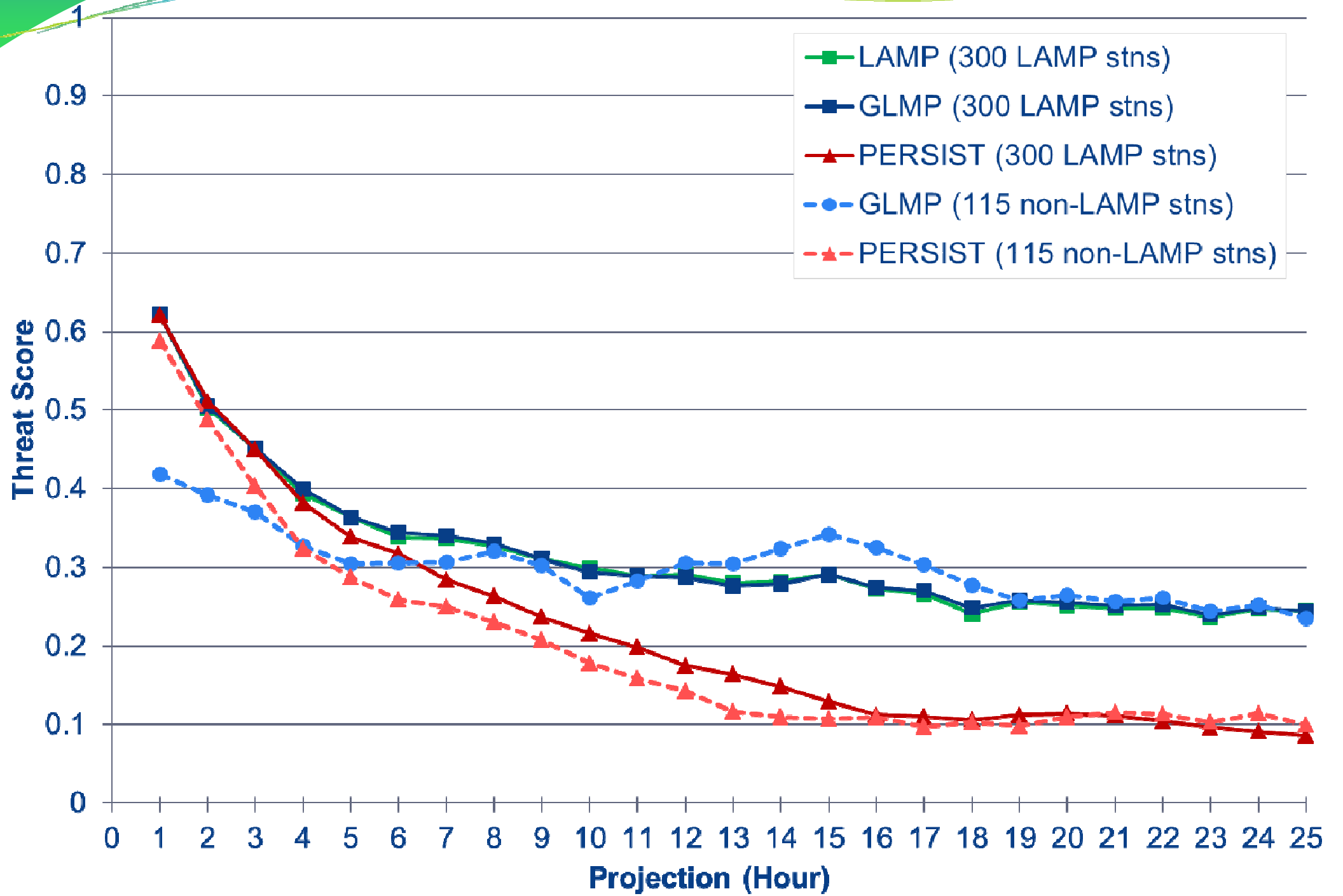
GLMP Temperature
Verified w/ RTMA

Ceiling Height and Visibility Station Verification

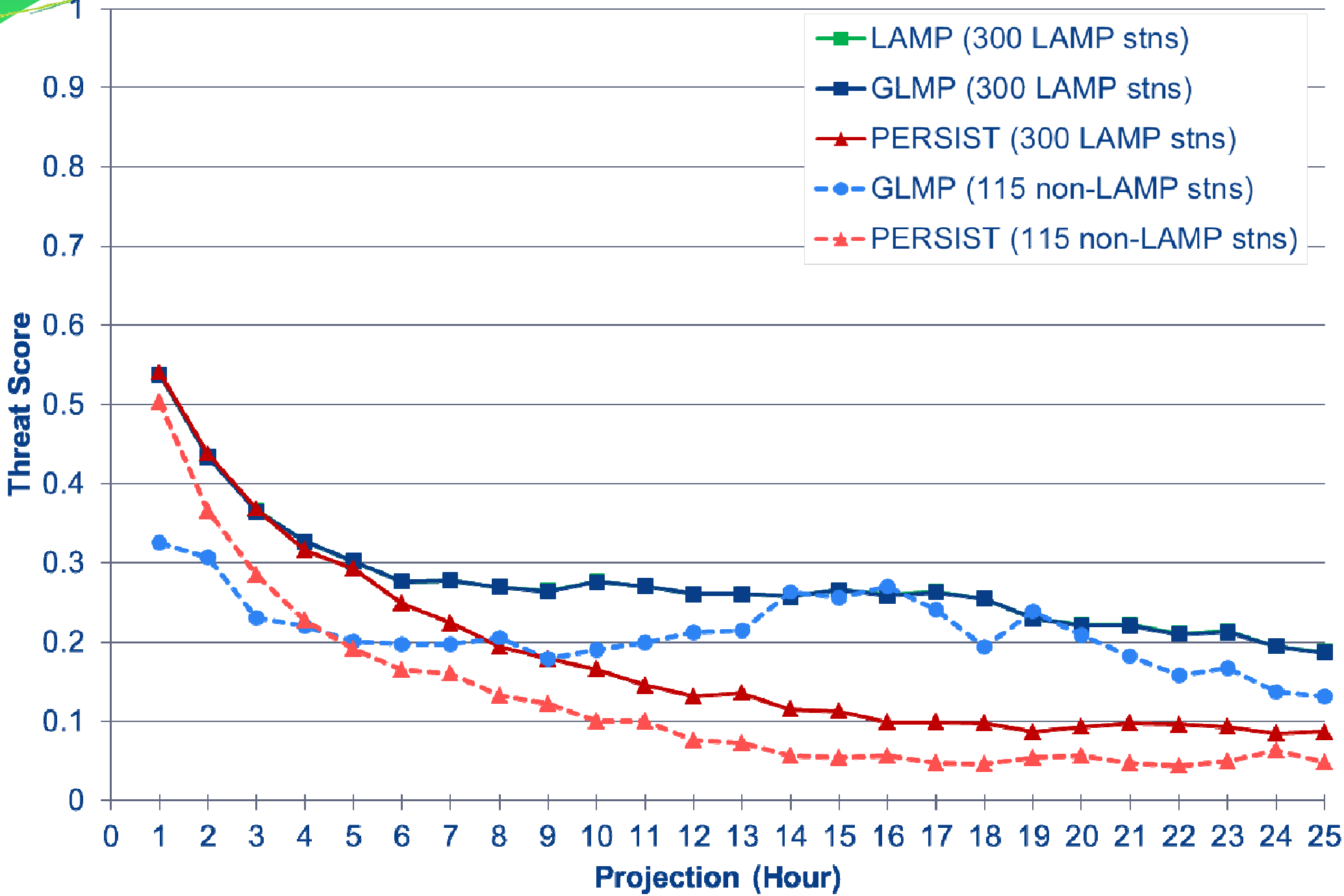
- No Gridded ceiling/visibility verifying observations other than from Gridded LAMP → verification done at stations only
- Two cycle times: 0600 (1800 UTC in paper)
- Verified for Nov-Dec, 2010
- Verifying at stations
  - At LAMP 300 stations
    - Purpose: to see if GLMP inter-polated to the stations is as good as actual LAMP at the stations.
  - At 115 non-LAMP stations
    - 115 stations where LAMP station forecasts were not available, but obs were available
    - Mimics with-held data testing



Threat Scores 0600 UTC Ceiling Height < 1000 FT
(At LAMP and NON-LAMP stations)

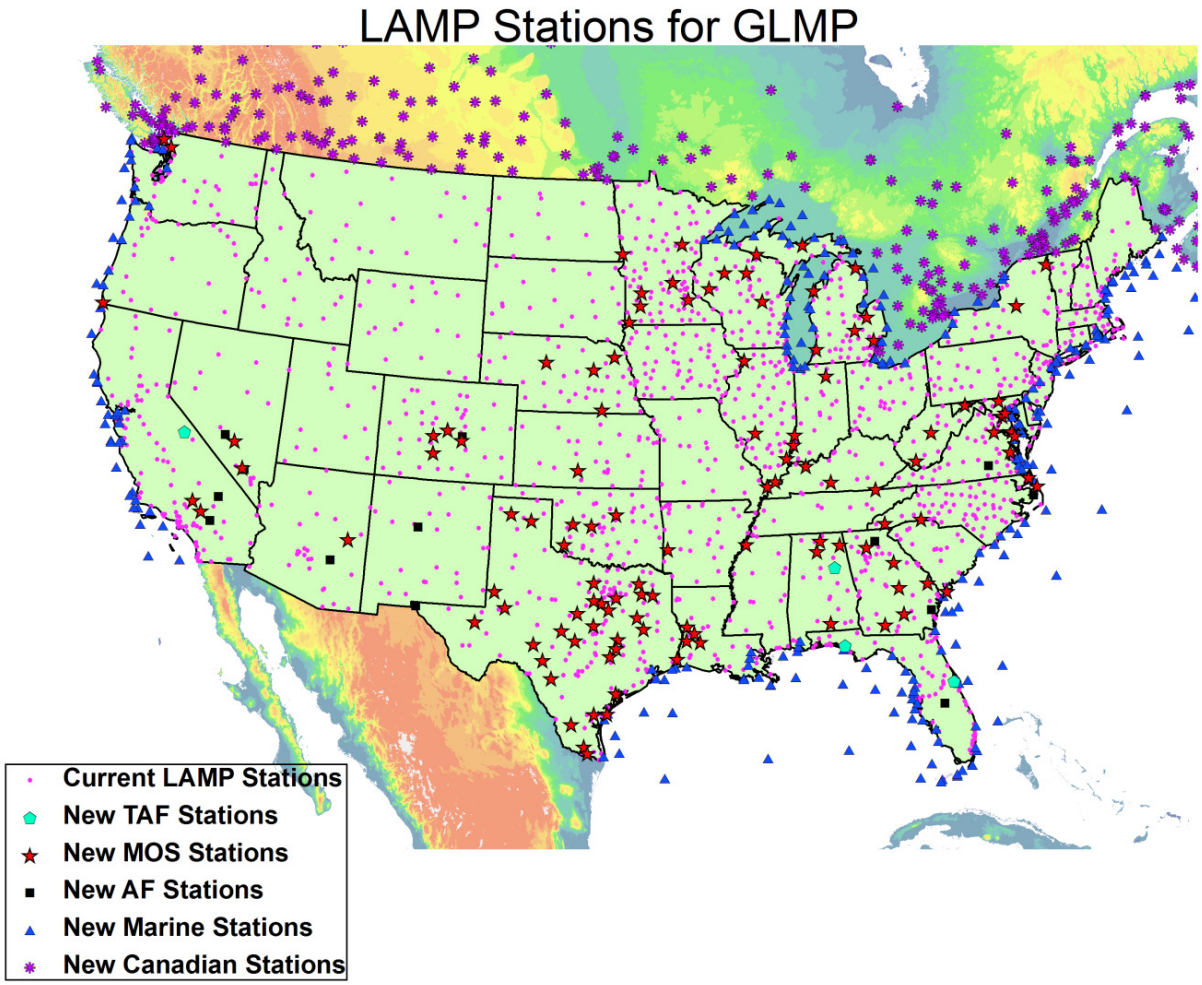


Threat Scores 0600 UTC Visibility < 3 MILES
(At LAMP and NON-LAMP stations)

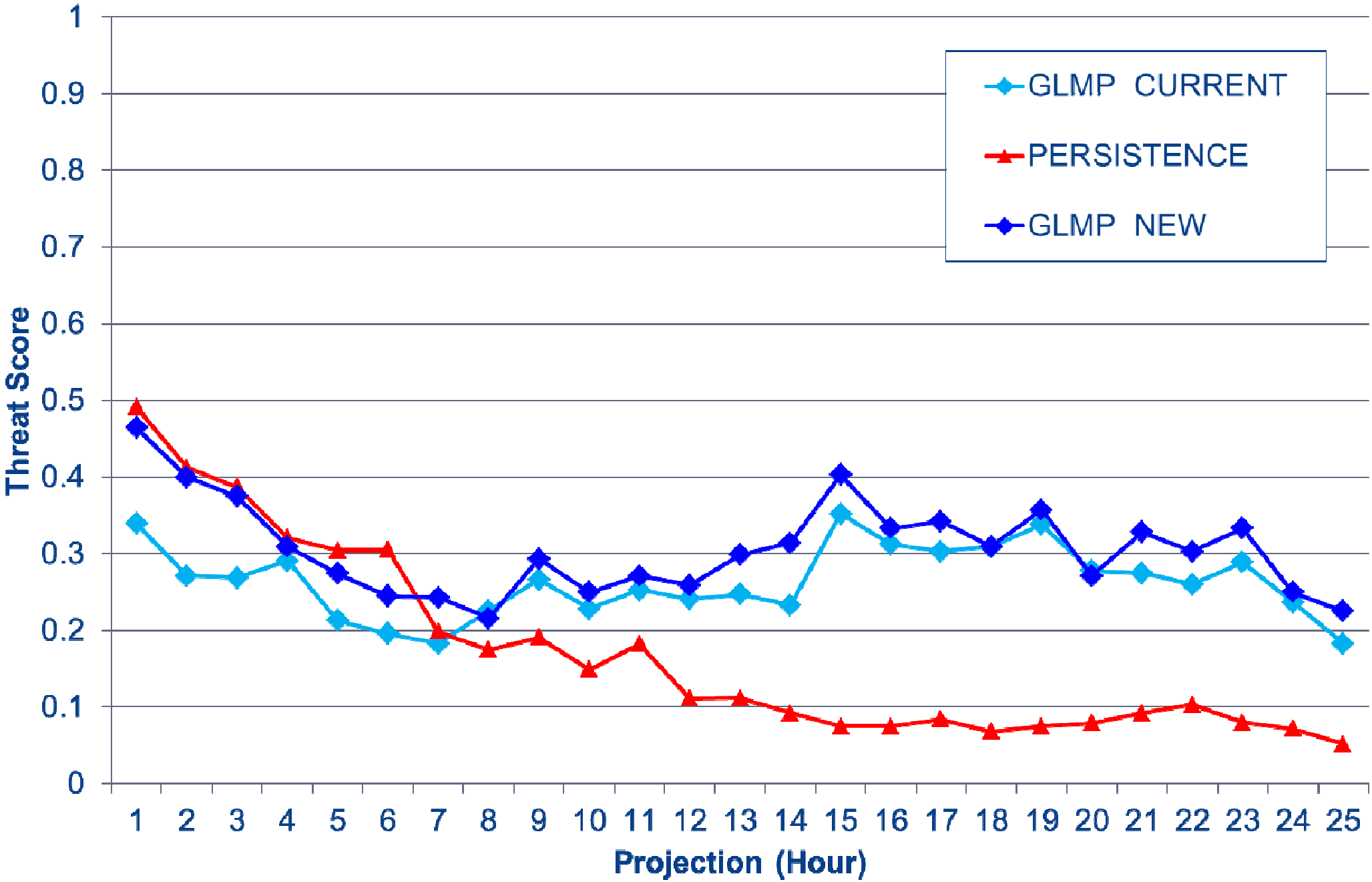


Future Improvements

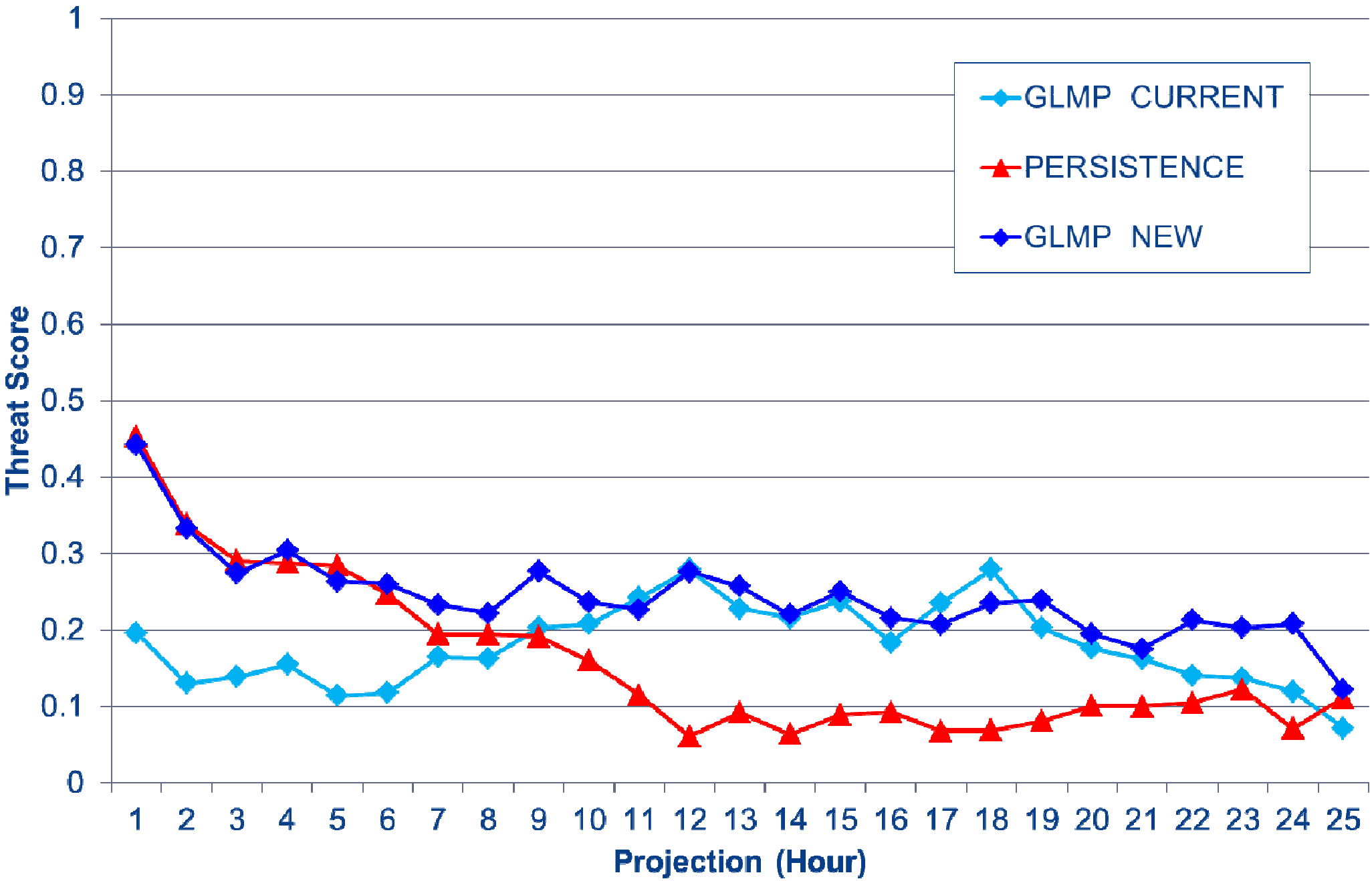
- Persistence Effect for temperature and dewpoint:
  - Uses spatial detail seen in 0-hr GLMP observations (10,000-12,000 input points) as well as additional MOS input points to provide more spatial detail in GLMP forecast analyses
- Redeveloped ceiling height
- Extension to 30 hrs
- Adding Stations
  - 119 new MOS stns (116 in CONUS)
  - 306 Marine stns
  - 274 Canadian stns
  - 4 new TAF stns
  - 15 military stns (13 in CONUS)



0600 UTC GLMP Verification
Ceiling Height < 1000 Feet
(11 Canadian Stations)



0600 UTC GLMP Verification
Visibility < 3 miles
(11 Canadian Stations)

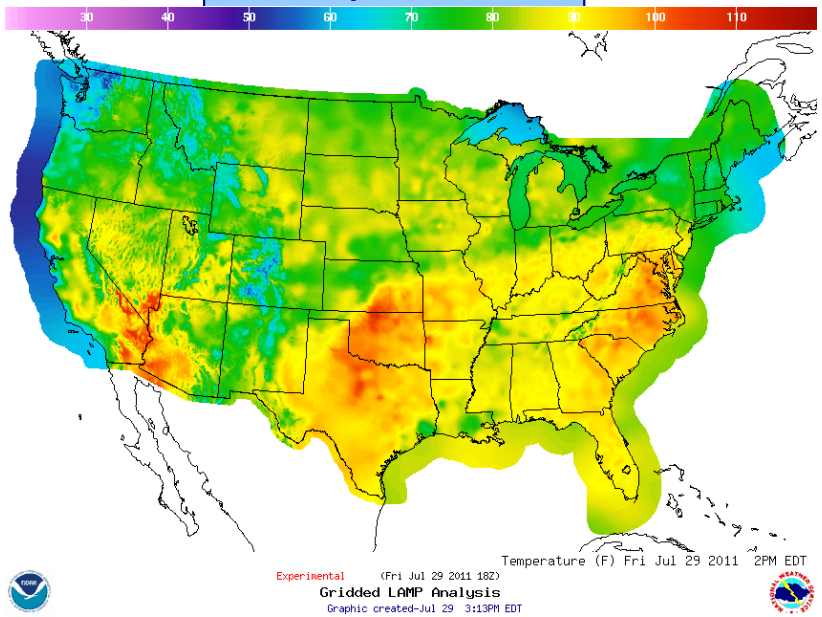


Summary

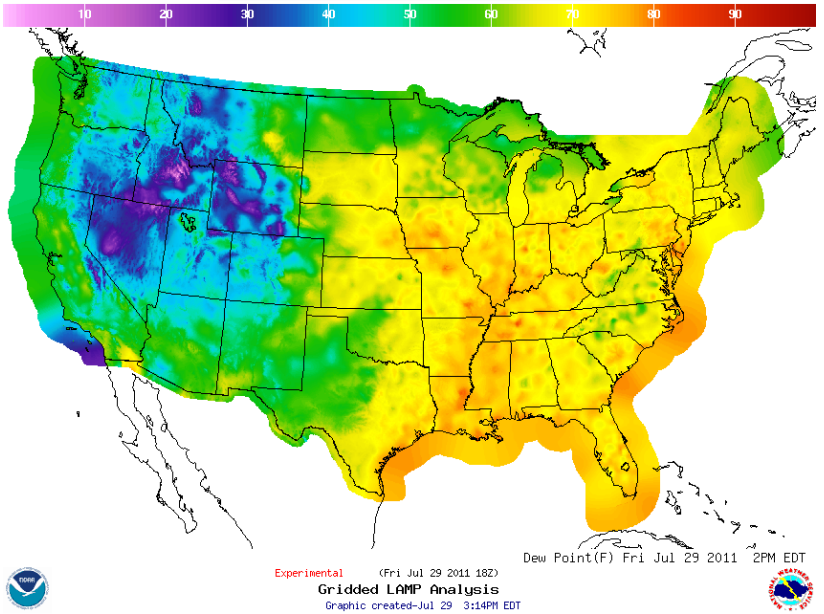
- GLMP running experimentally at NCEP for temperature, dewpoint, ceiling height, and visibility; GLMP useful in the creation of digital aviation products
- GLMP for temperature and dewpoint :
  - Overall, GLMP shows improvement over GMOS, as expected, independent of verifying data (GLMP gridded obs or RTMA)
  - By gridpoint, GMOS temperature is better than GLMP temperature in Western Region for some gridpoints, some projections
    - Potential solution developed and soon to be tested. Would be implemented in 2012.
- GLMP for ceiling height and visibility:
  - Overall, GLMP interpolated to LAMP stations shows no degradation compared to LAMP guidance at stations, as expected
  - GLMP interpolated to non-LAMP stations potentially worse than GLMP interpolated to LAMP stations, as expected
  - Improvements were seen in Canada after adding Canadian stations (to be implemented in future)
- LAMP Website:
  - http://www.nws.noaa.gov/mdl/gfslamp/gfslamp.shtml
- Contact:
  - Judy.Ghirardelli@noaa.gov

Gridded LAMP Observations

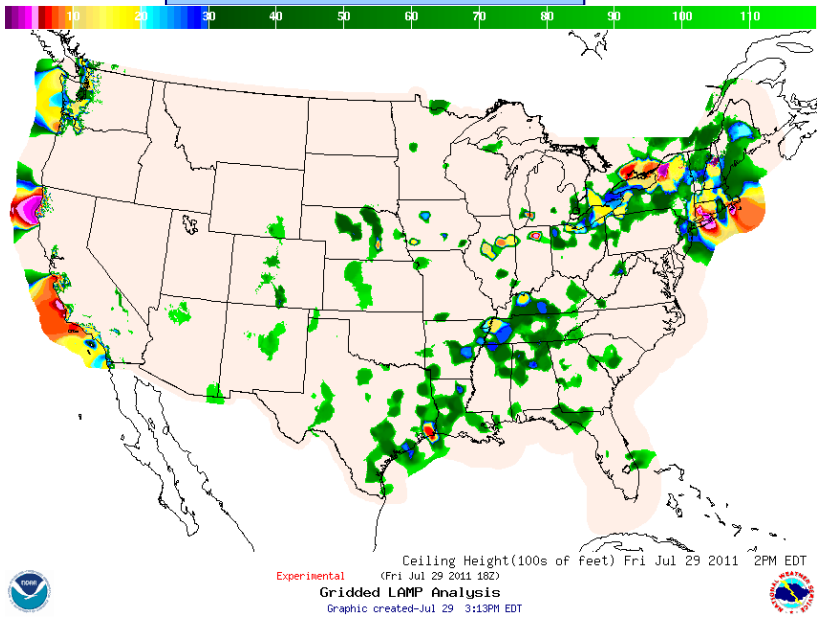
Temperature



Dewpoint



Ceiling Height



Visibility