

# NMM-b Implementation Verification Results – Warm Season

Verifications Performed By:

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SCEP, Statistical Modeling Branch

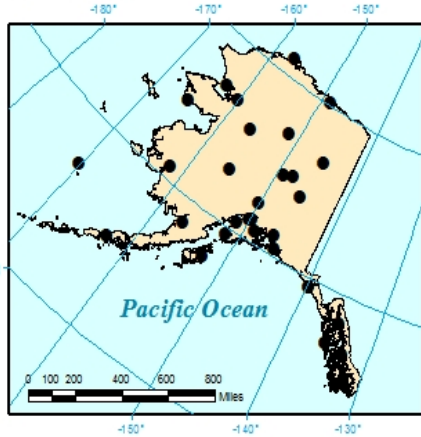
MDL/OST/NWS

For more information, please contact:

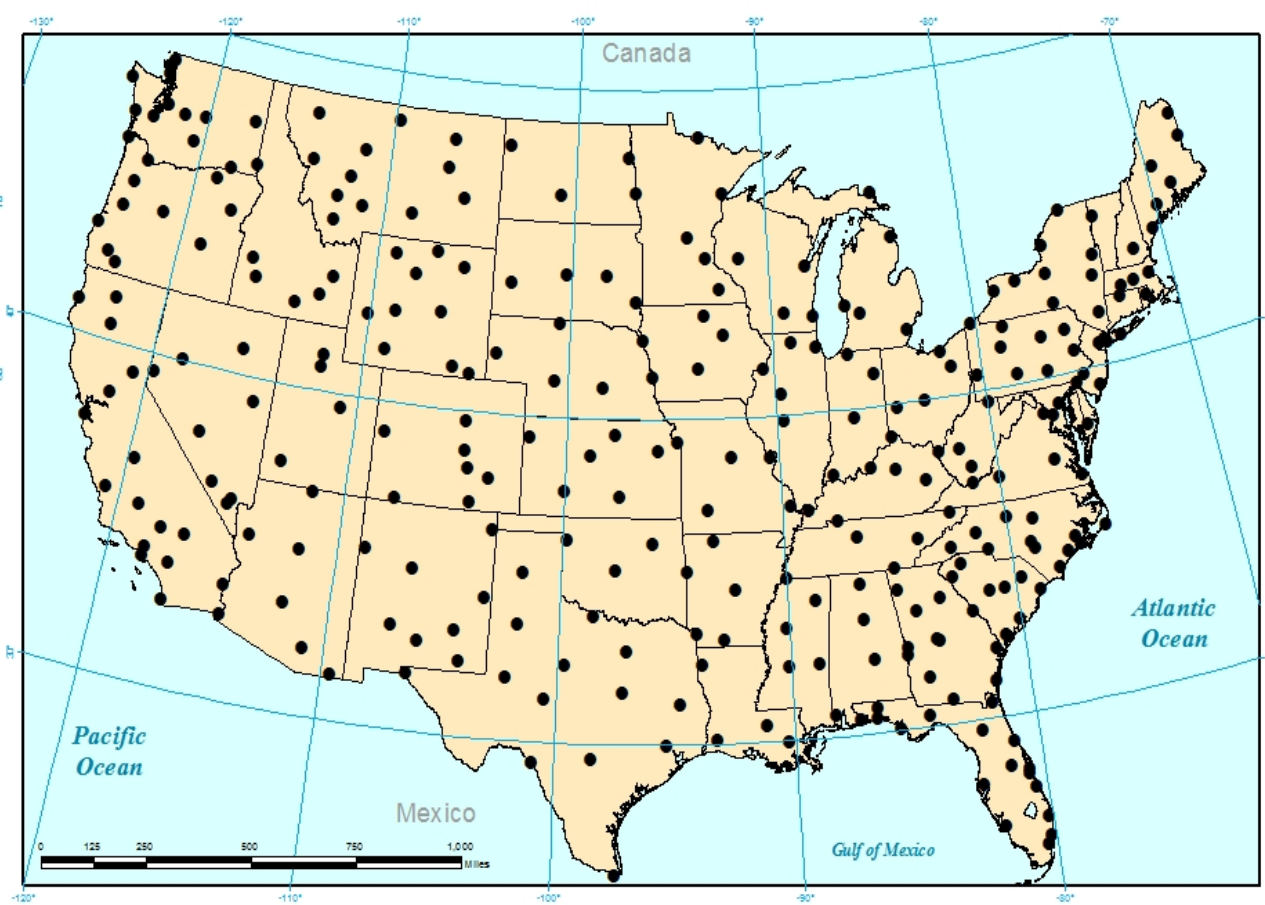
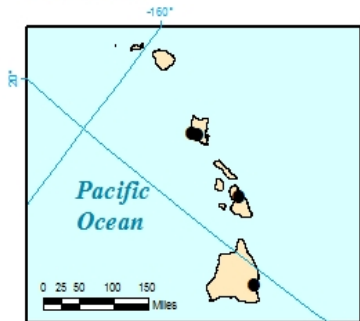
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- Mark Antolik – [mark.antolik@noaa.gov](mailto:mark.antolik@noaa.gov)
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- Verifications of parallel NMM-b model output on the current NAM MOS system
- Compared to current operational NAM MOS system and GFS model
- Verification Period: April 1 – Sept. 30, 2010
  - Missing ~20 days worth of data
- SMB Standard 335 Verification Stations
  - 300 CONUS, 30 Alaska, 5 Hawaii/Puerto Rico

## Alaska



## Hawaii



# MOS Verification Sites - 335 Stations

Albers Projection  
Central Meridian: 98  
1st Standard Parallel: 20  
2nd Standard Parallel: 80  
Latitude of Origin: 40

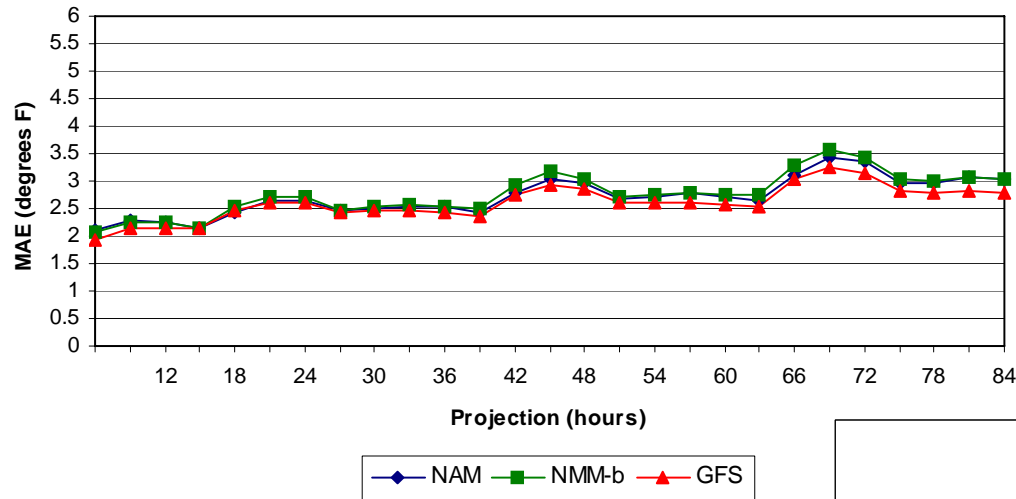


# Parameters & Scores

- 2m Temperature, Dew Point, Max/Min Temp
  - MAE and Bias
- Wind Speed
  - MAE and HSS
- Wind Direction
  - MAE and CRF
- 06 & 12 hr POP
  - Brier Score

# 2m Temperature (6-84/every 3 hours)

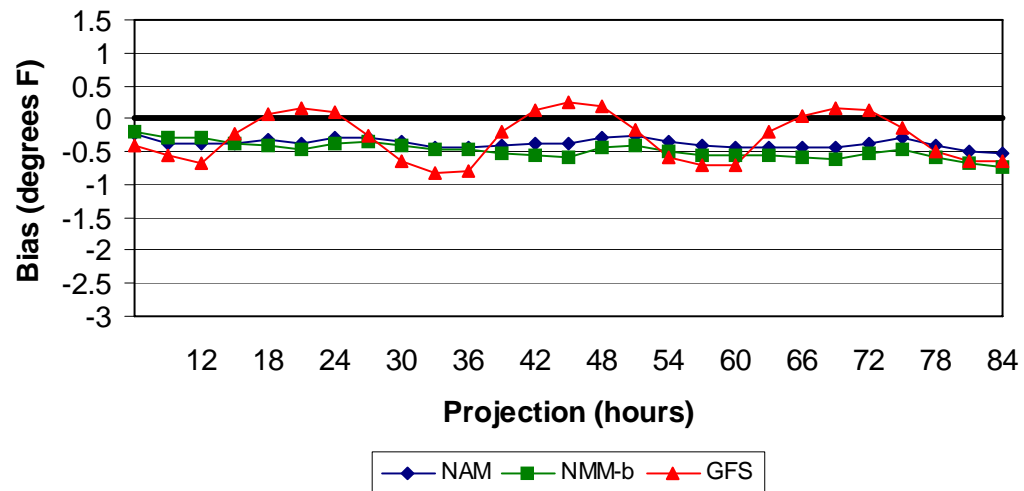
00Z Temp MAE, Overall (335 stations)  
April 1 - Sept 30, 2010



- All regions, NAM and NMM-b MAE are similar
- Differences < 0.2 degrees

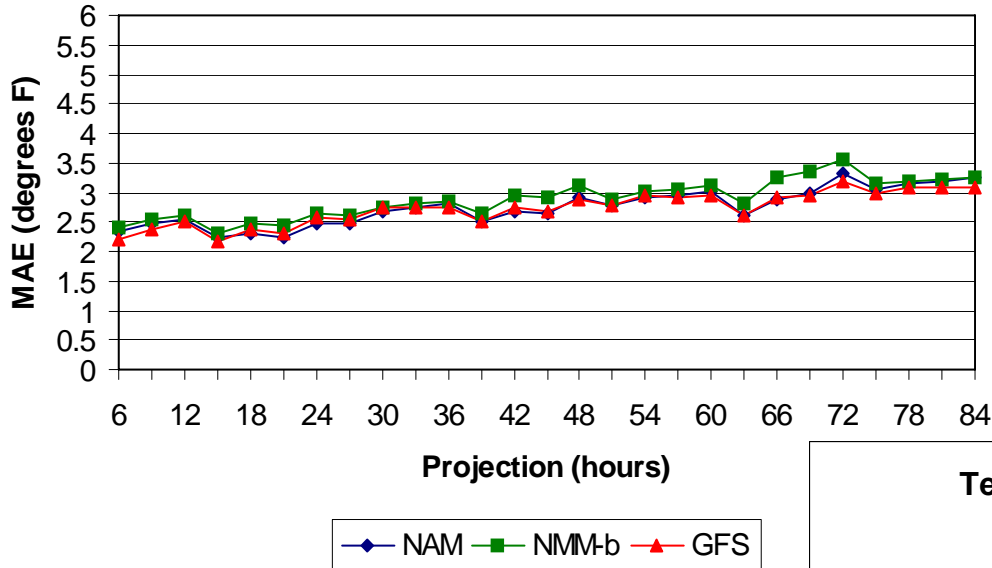
- All models consistently cool
- NAM/NMM-b bias differences < 0.2 degrees

00Z Temp Bias, Overall (335 stations)  
April 1 - Sept 30, 2010



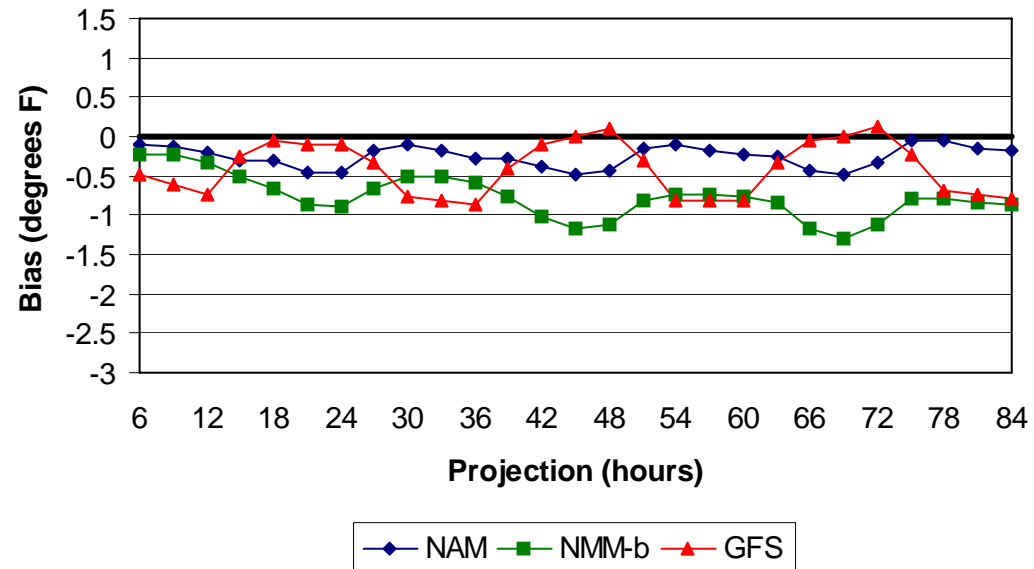
# 2m Temperature - Regional

Temperature MAE, Southwest CONUS (50 stations)  
April 1 - Sept 30, 2010



- Regionally, NMM-b MAE similar in all regions, slightly worse in Southwest
- Differences < 0.5 degrees

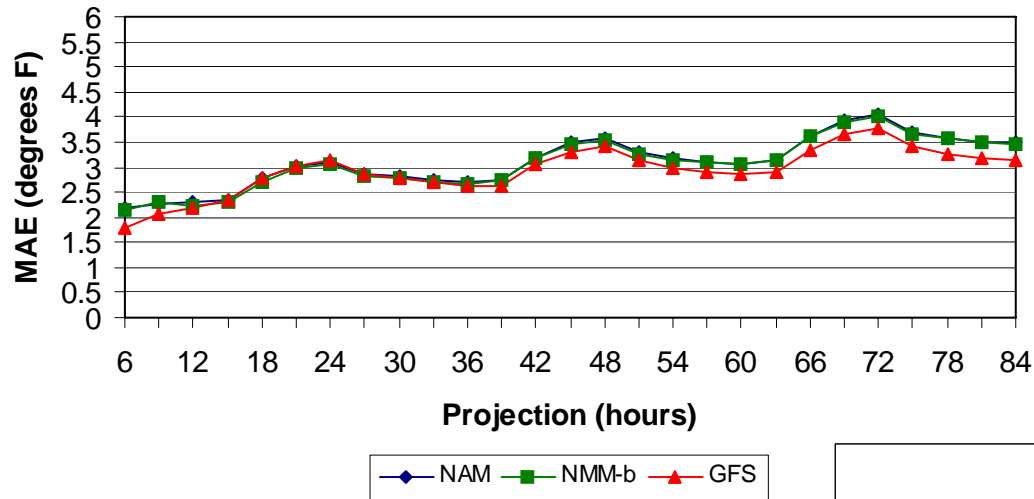
Temperature Bias, Southwest CONUS (50 stations)  
April 1 - Sept 30, 2010



- NMM-b bias worse than NAM
  - Southwest, Southeast
- NMM-b bias better than NAM
  - Northeast, North Central
- NMM-b bias similar to NAM
  - South Central, Northwest
- Differences < 1 degree

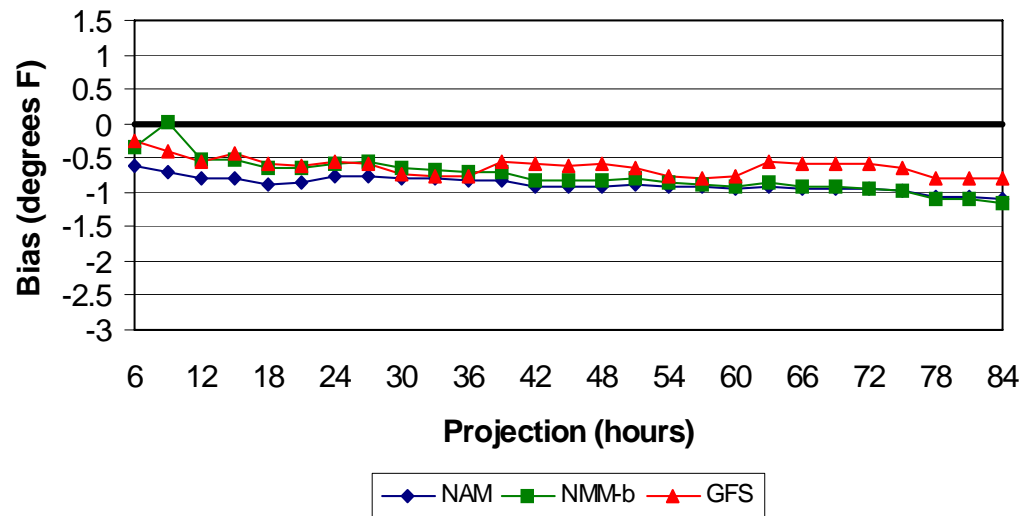
# Dew Point (6-84/every 3 hours)

Dew Point MAE, Overall (335 stations)  
April 1 - Sept 30, 2010



- NAM and NMM-b MAE similar across all regions
- Differences < 0.2 degrees

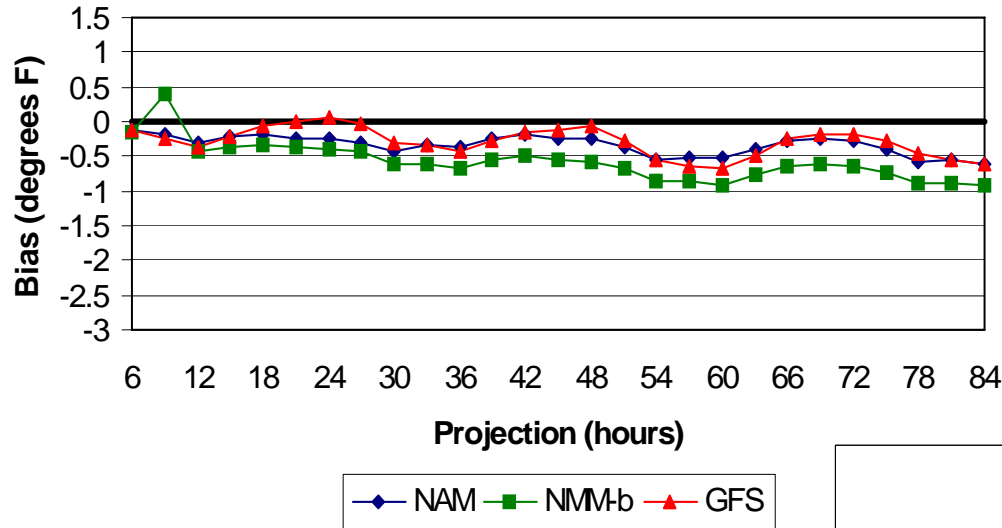
Dew Point Bias, Overall (335 stations)  
April 1 - Sept 30, 2010



- All models consistently dry
- NMM-b bias better than NAM – Overall / CONUS
- Differences < 0.5 degrees

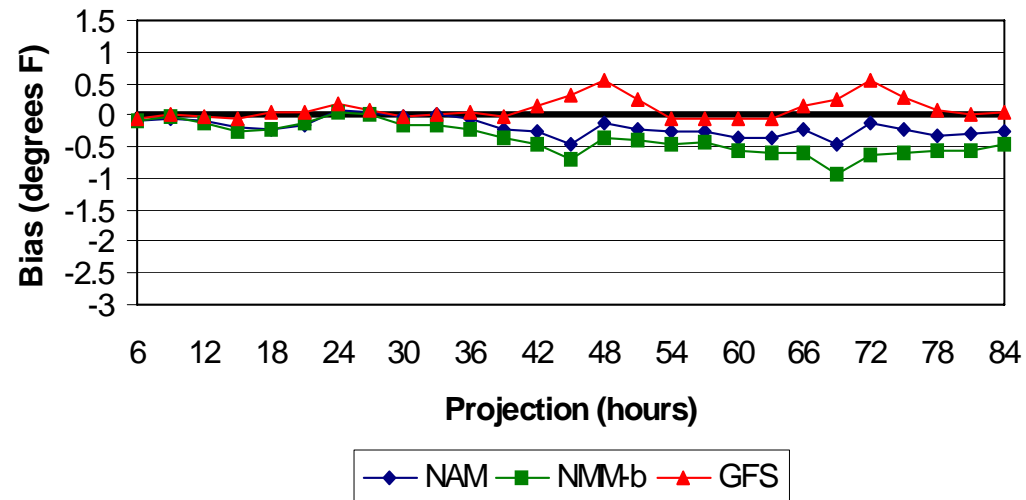
# Dew Point – Alaska & Hawaii

Dewpoint Bias, Alaska (30 stations)  
April 1 - Sept 30, 2010



- Alaska & Hawaii NMM-b bias slightly worse than NAM
- Differences < 0.5 degrees

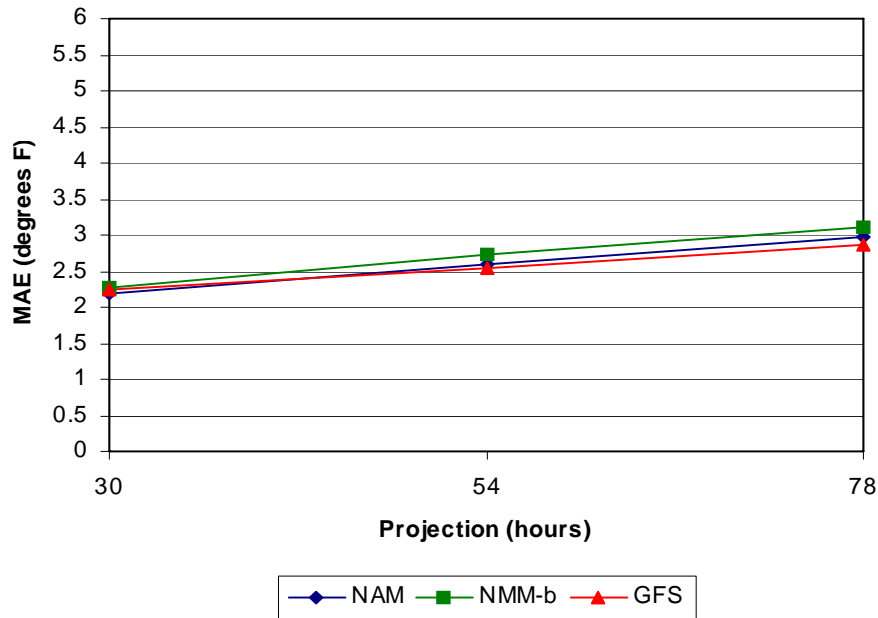
Dewpoint Bias, Hawaii/Puerto Rico (5 stations)  
April 1 - Sept 30, 2010





# Max Temperature (30, 54, 78 hours)

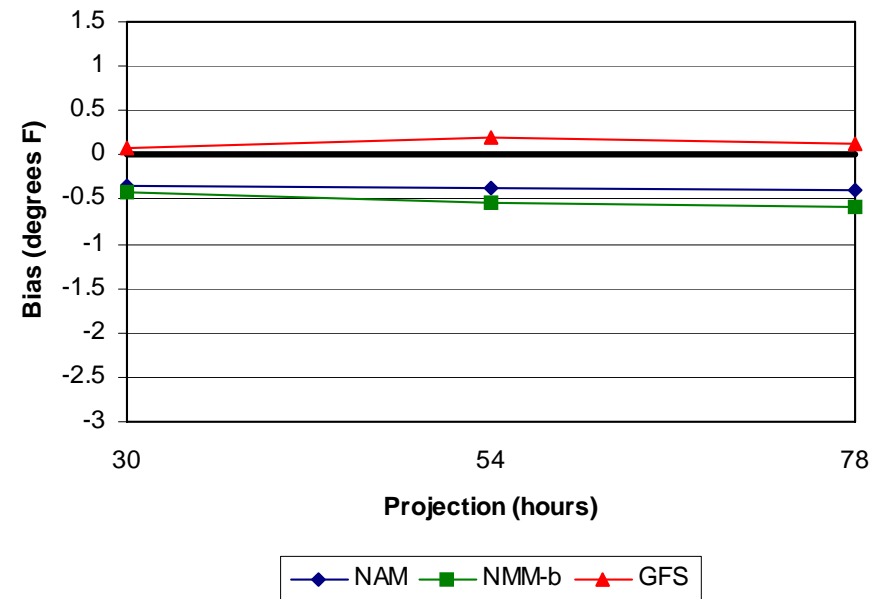
Max Temperature MAE, Overall (335 stations)  
April 1 - Sept 30, 2010



- NMM-b MAE similar to NAM in all regions
- Differences < 0.25 degrees

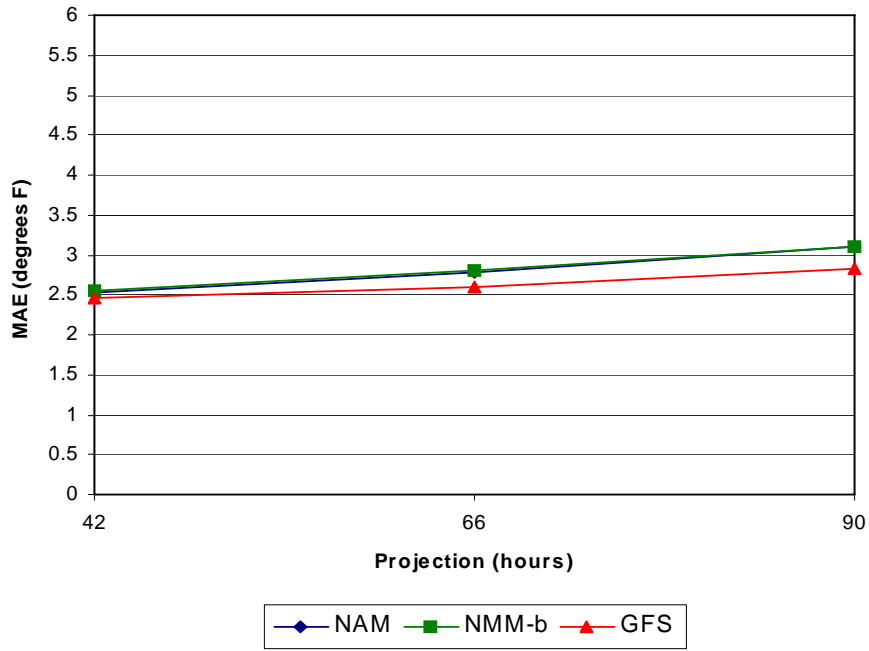
- NMM-b Bias similar to NAM
- Differences < 0.2 degrees
- Cool bias across all regions – warm in Hawaii

Max temperature Bias, Overall (335 stations)  
April 1 - Sept 30, 2010

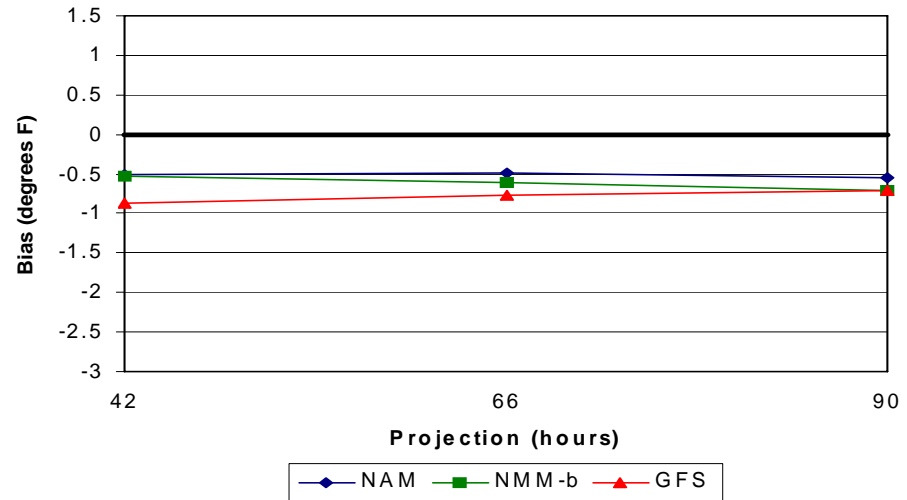


# Min Temperature (42, 66, 90 hours)

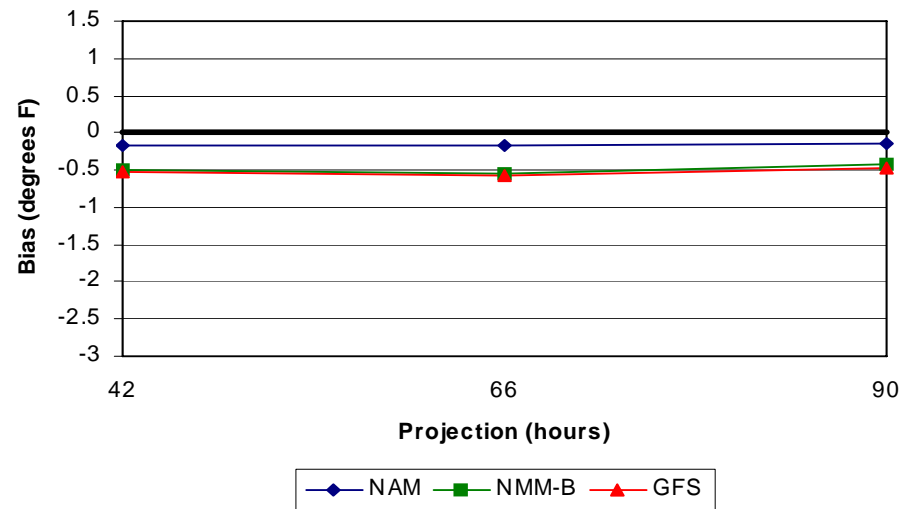
Min Temperature MAE, Overall (335 stations)  
April 1 - Sept 30, 2010



Min Temperature Bias, Overall (335 stations)  
April 1 - Sept 30, 2010



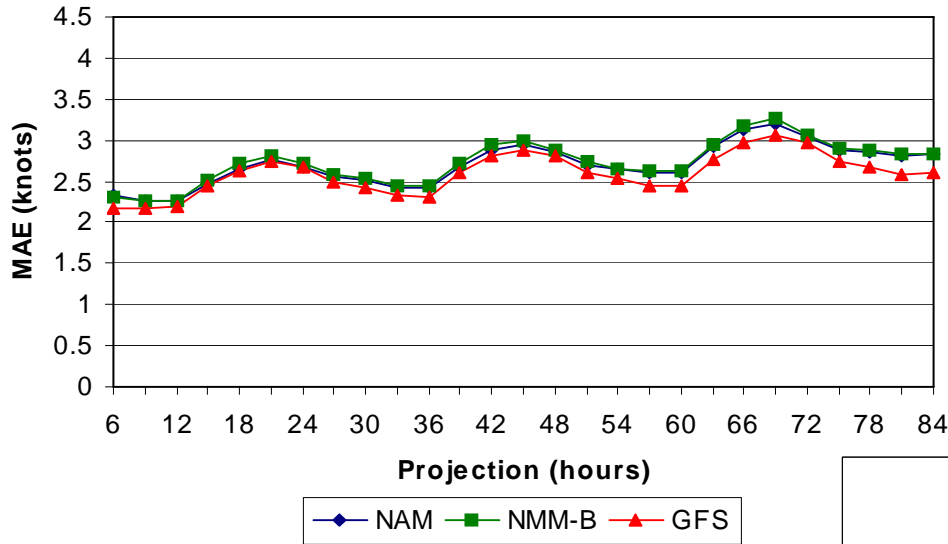
Min Temperature Bias, Alaska (30 stations)  
April 1 - Sept 30, 2010



- NMM-b and NAM MAE similar across all regions
  - Differences < 0.1 degrees
- NMM-b bias slightly worse than NAM – esp. Alaska
  - Differences < 0.5 degrees

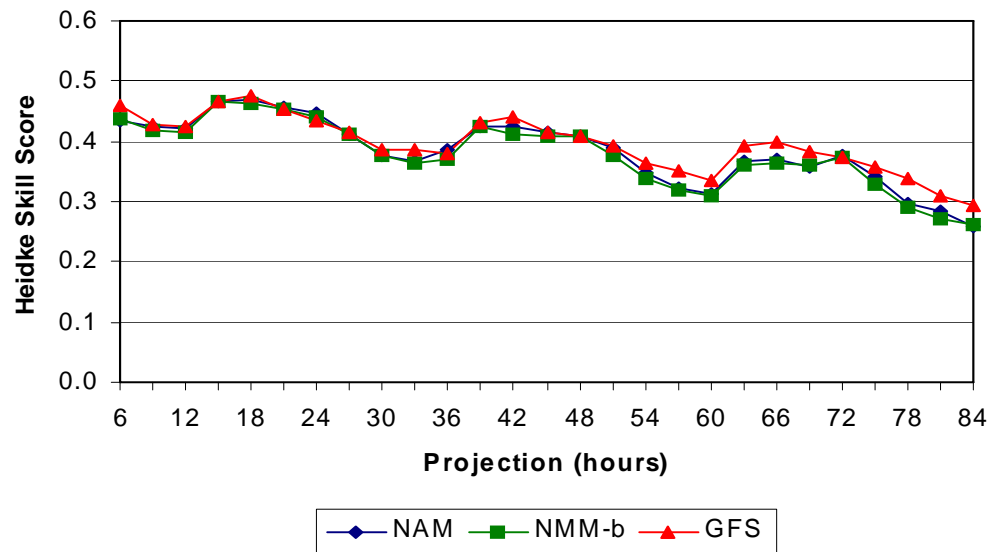
# Wind Speed – MAE & HSS

Wind Speed MAE, Overall (335 stations)  
April 1 - Sept 30, 2010



- NMM-b MAE very similar to NAM across all regions
- Slightly worse in Alaska (next slide)
- Differences < 0.25 knots

Wind Speed HSS, Overall (335 Stations)  
April 1 - September 30, 2010

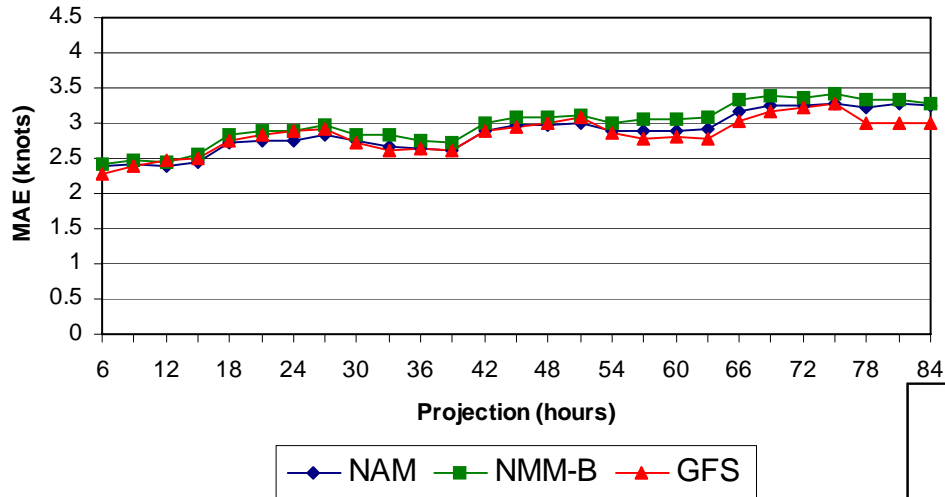


- NMM-b skill very similar to NAM across all regions
- Slightly worse in Alaska (next slide)
- Differences < 0.05

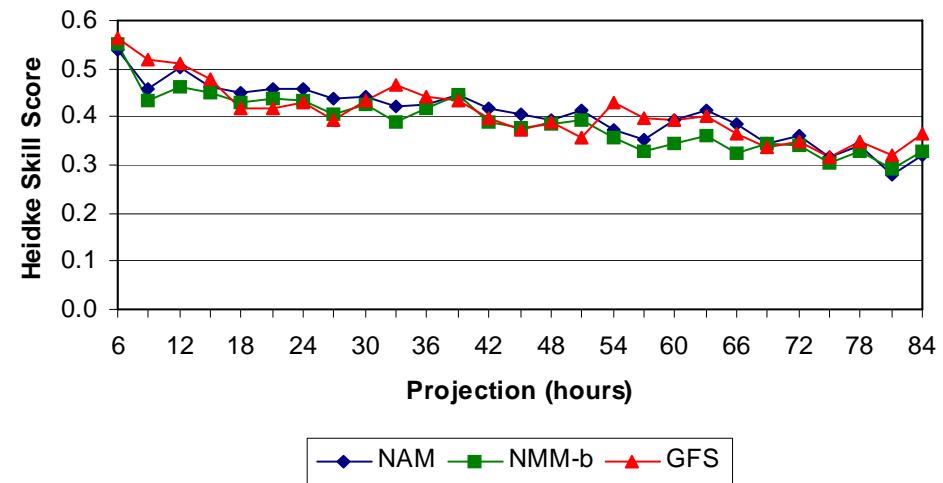
# Wind Speed – MAE & HSS

## Alaska

Wind Speed MAE, Alaska (30 stations), April 1 - Sept 30, 2010

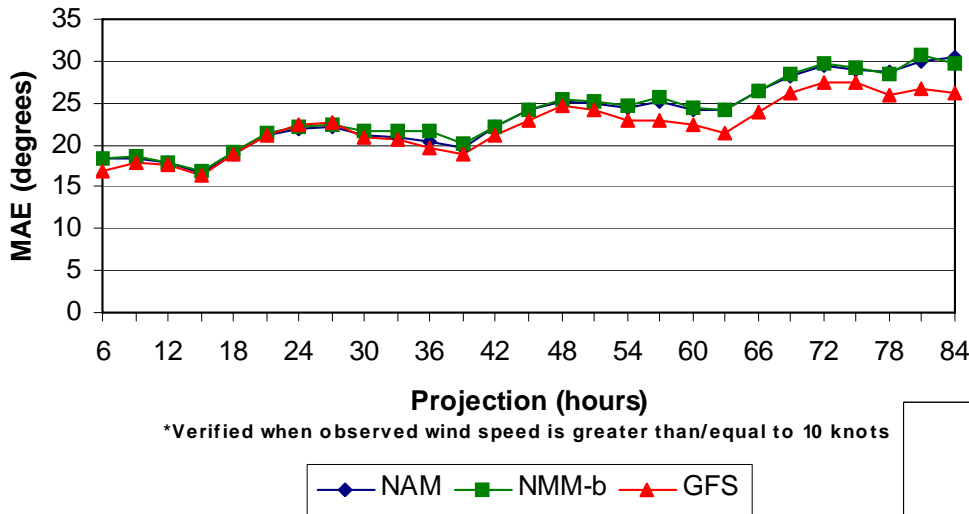


Heidke Skill Score - Wind Speed, Alaska (30 stations), April 1 - September 30, 2010



# Wind Direction – MAE & CRF

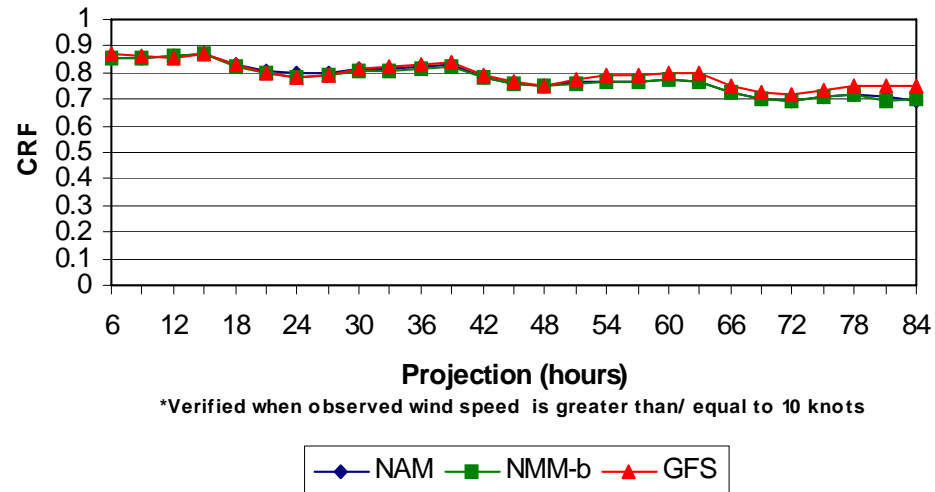
Wind Direction MAE, Overall (335 stations)  
April 1 - Sept 30, 2010



- NMM-b MAE very similar to NAM across all regions

- CRF for all models very similar across all regions

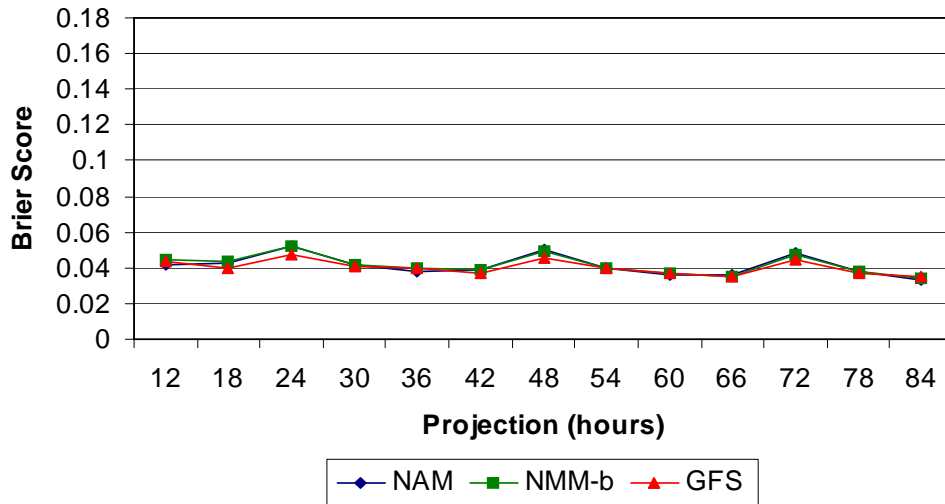
Cumulative Relative Frequency of Errors less than/equal to 30 degrees - Wind Direction  
Overall (335 stations), April - Sept, 2010



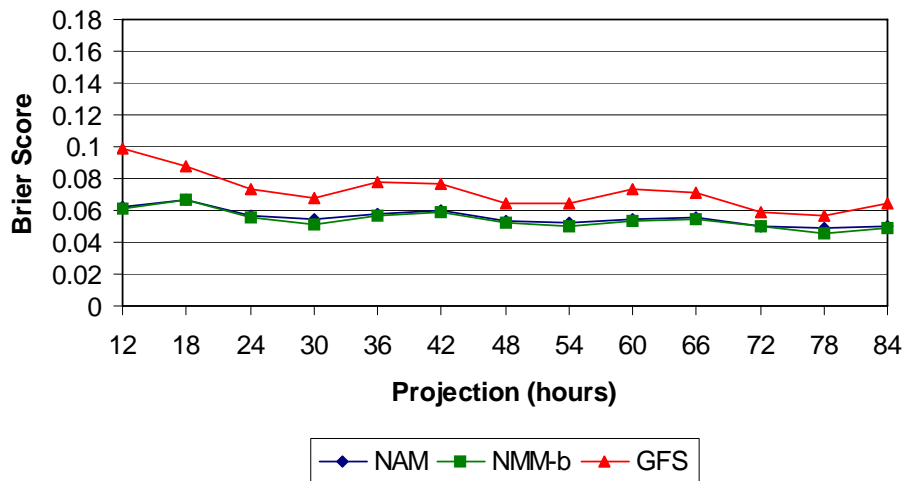
# 06 hour POP – Brier Score

- Overall/CONUS – Brier Scores similar for all models
- Alaska/Hawaii – Brier Scores similar for NAM & NMM-b and lower than GFS

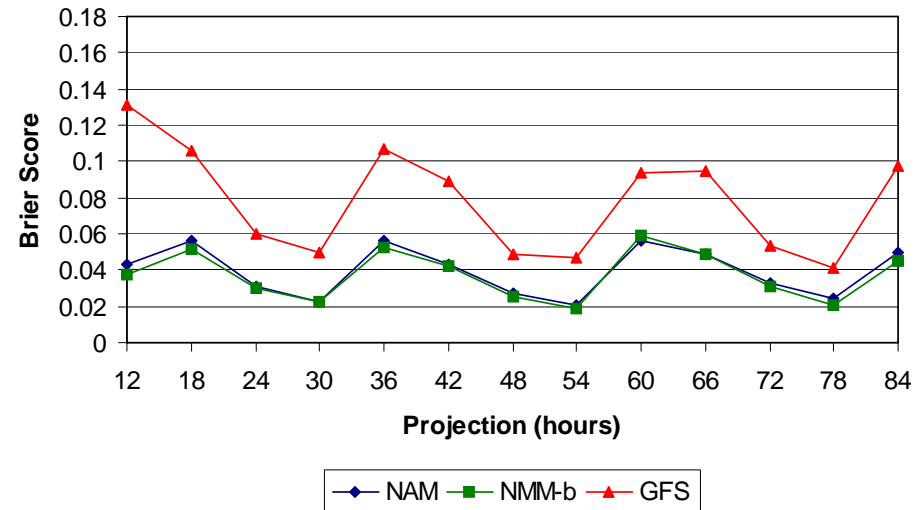
6hr Precipitation Brier Score, CONUS (300 stations)  
April - September, 2010



6 hour Precip Brier Score, Alaska (30 stations), April - September, 2010

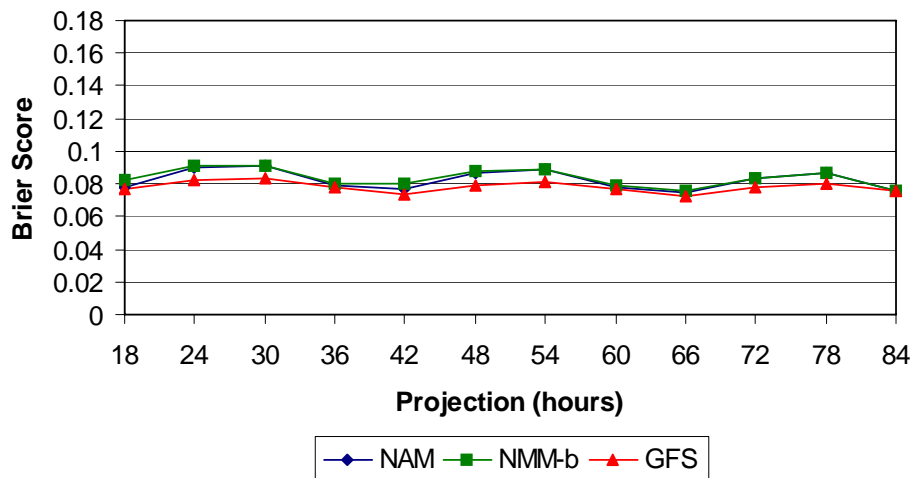


6hr Precip Brier Score, Hawaii/Puerto Rico (5 stations), April - September, 2010



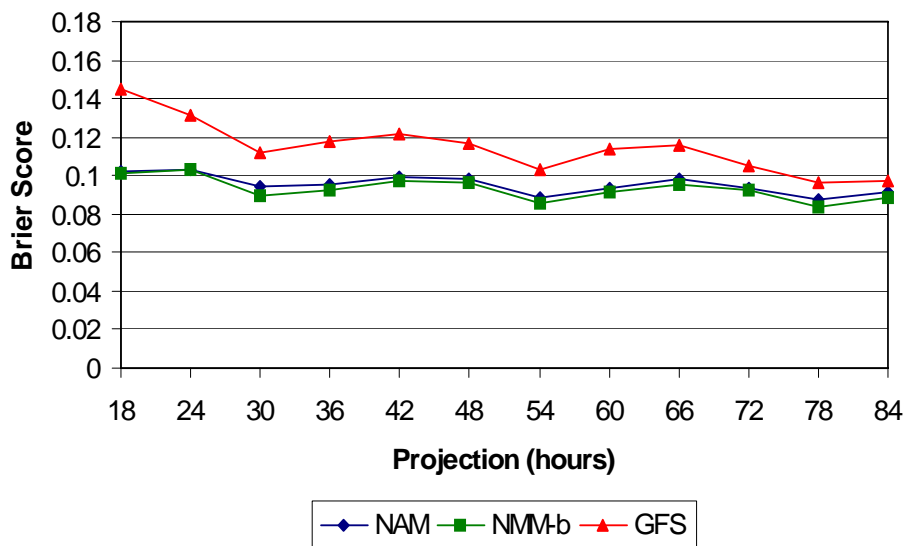
# 12 hr POP – Brier Score

12 hr Precip, Brier Score, CONUS (300 stations)  
April 1 - September 30, 2010

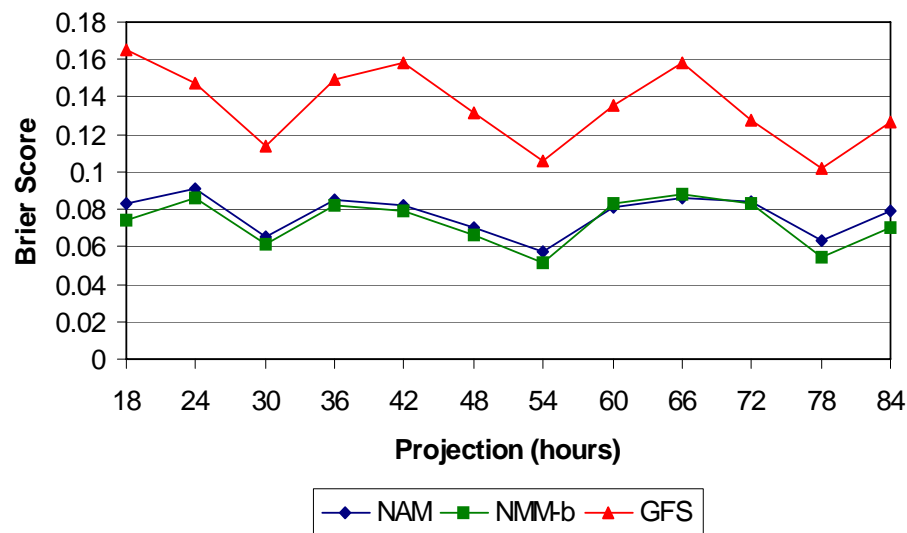


- Overall/CONUS – Brier Scores similar for NAM & NMM-b and slightly higher than GFS
- Alaska/Hawaii – Brier Scores similar for NAM & NMM-b and lower than GFS

12 hr Precip, Brier Score, Alaska (30 stations)  
April 1 - September 30, 2010



12 hr Precip, Brier Score, Hawaii/Puerto Rico (5 stations), April 1 - September 30, 2010



# Warm Season Overall Summary

- NMM-b exhibits slight cool/dry bias in some situations. However, MOS forecasts generated from operational NAM system and NMM-b output verify similarly overall
- We expect no significant warm-season impacts to MOS with the NMM-b implementation