

# NMM-b Implementation Verification Results – Cool Season

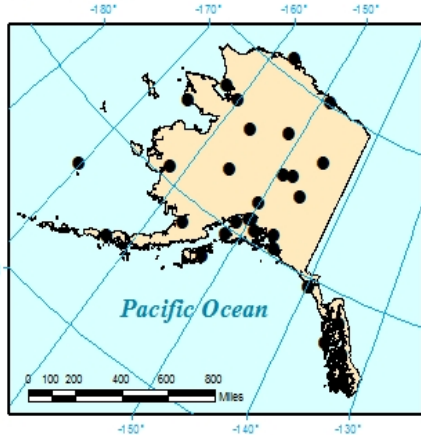
Verifications Performed By:  
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MDL/OST/NWS

**For more information, please contact:**

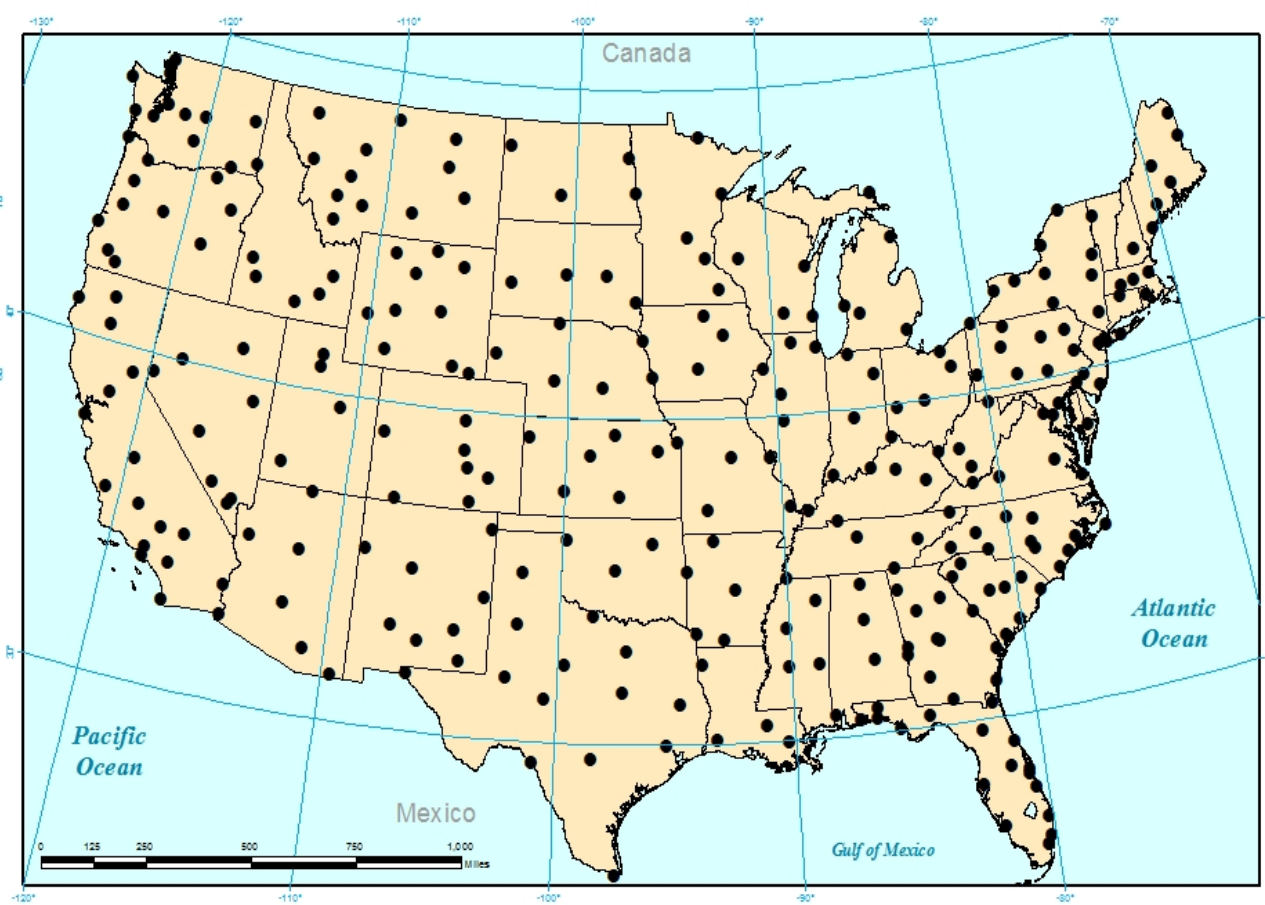
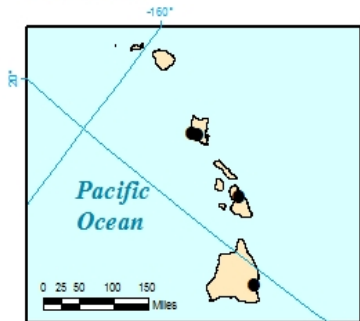
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- Compared current NAM MOS with MOS on NMM-b parallel
- Cool Season Verification Period
  - Oct 1, 2010 – March 31, 2011
- SMB standard 335 stations
- Parameters & Scores:
  - 2-m Temp, Dew Point, Max, Min – MAE & Bias
  - Wind Speed – MAE & HSS
  - Wind Direction – MAE & CRF
  - 6, 12 hour Precip – Brier Score
- 4 regions for each parameter
  - Overall (335), CONUS (300), Alaska (30), Hawaii/Puerto Rico (5 stations)
  - Temp & Dew Point CONUS also run regionally
    - 6 regions, 50 stations each region

## Alaska



## Hawaii



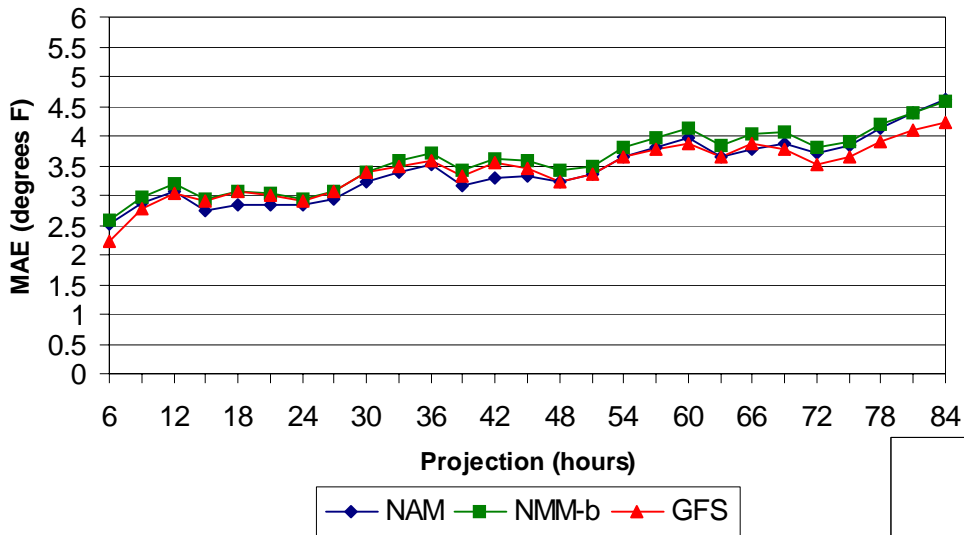
# MOS Verification Sites - 335 Stations

Albers Projection  
Central Meridian: 96  
1st Standard Parallel: 20  
2nd Standard Parallel: 60  
Latitude of Origin: 40



# 2-m Temperature

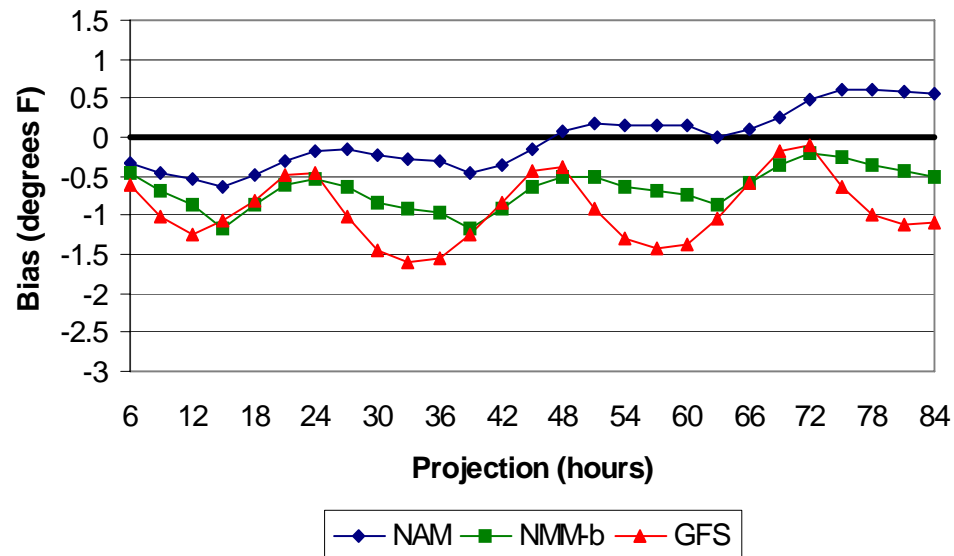
00Z Temp MAE, Overall (335 stations)  
October 1, 2010 - March 31, 2011



- NMM-b MAE slightly worse or similar to NAM
- Differences < 0.5 degrees

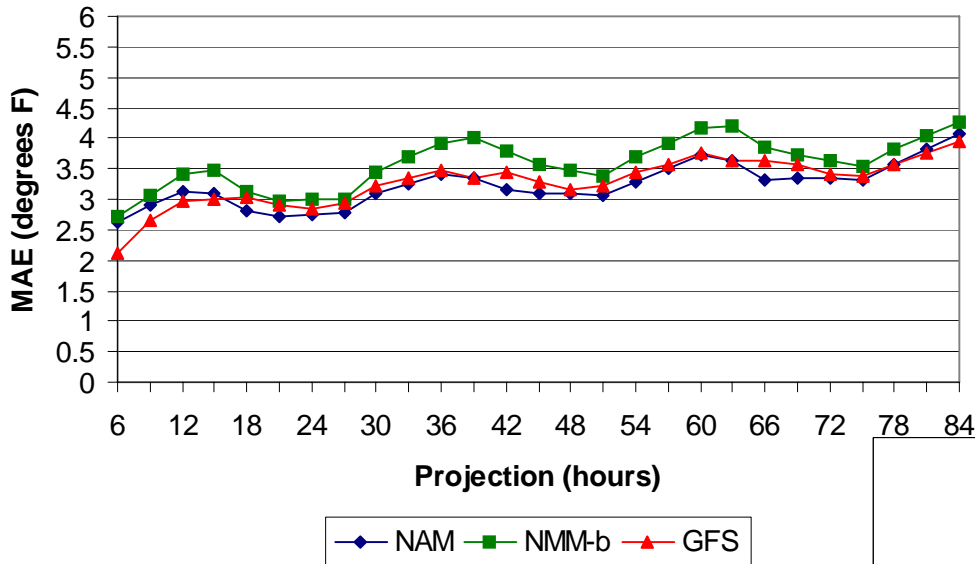
- Overall NMM-b cool bias across all regions, worse than NAM
- Differences < 1 degrees
- GFS similar to, or worse than, NMM-b except in Southwest

00Z Temp Bias, Overall (335 stations)  
Oct 1, 2010 - March 31, 2011



# 2-m Temperature - Regional

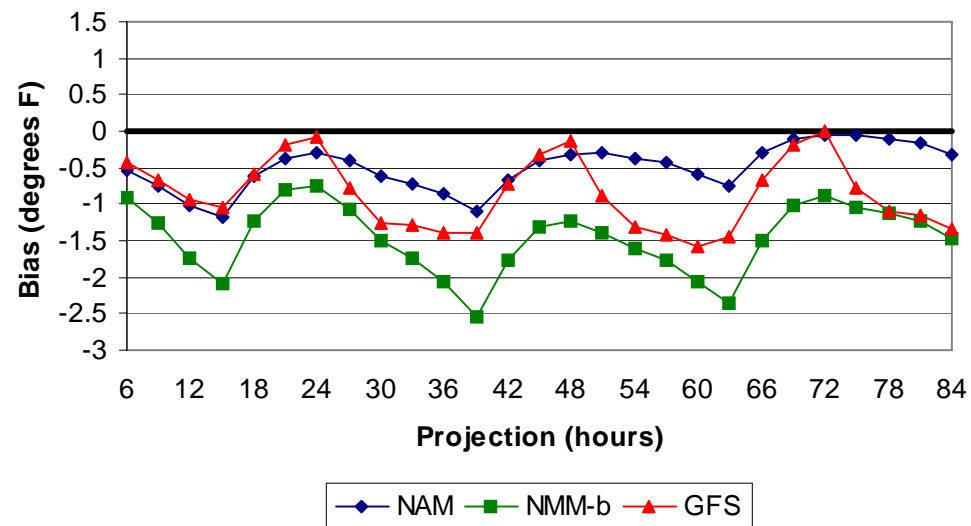
Temperature MAE, Southwest CONUS (50 stations)  
Oct 1, 2010 - March 31, 2011



- NMM-b MAE similar to NAM in some regions, worse than NAM in others. Greatest difference in Southwest
- Differences between 0 and ~0.5

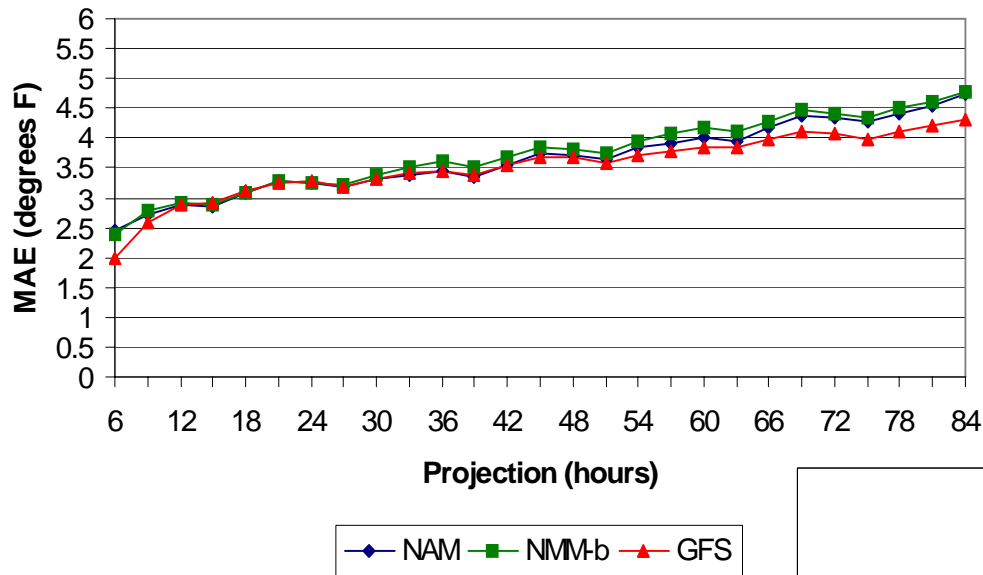
- Overall NMM-b cool bias across all regions, worse than NAM
- Differences as great as almost 2 degrees

Temperature Bias, Southwest CONUS (50 stations)  
Oct 1, 2010 - March 31, 2011



# Dew Point

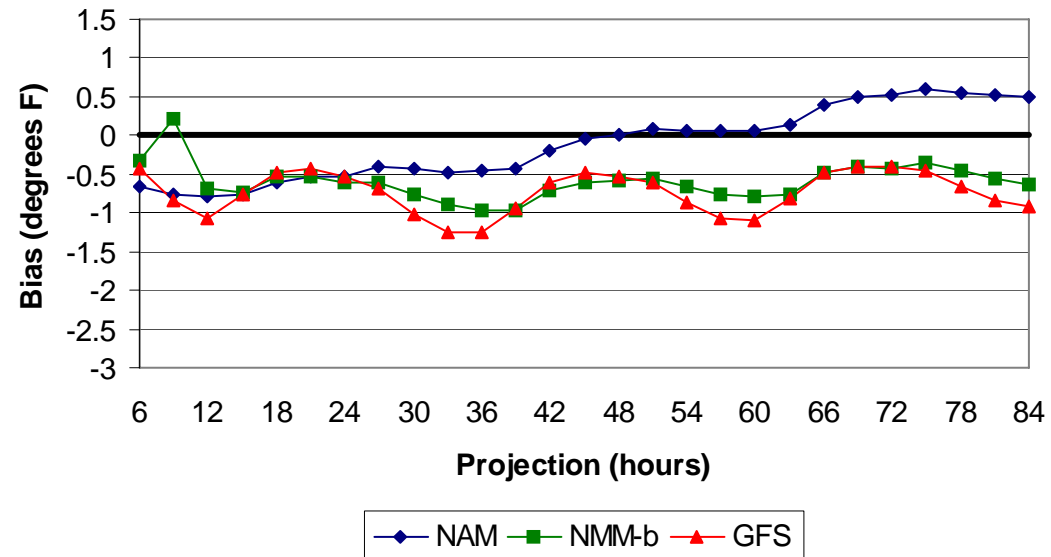
Dew point MAE, Overall (335 stations)  
Oct 1, 2010 - March 31, 2011



- NMM-b MAE close to NAM for all regions
- Differences < 0.5 degrees

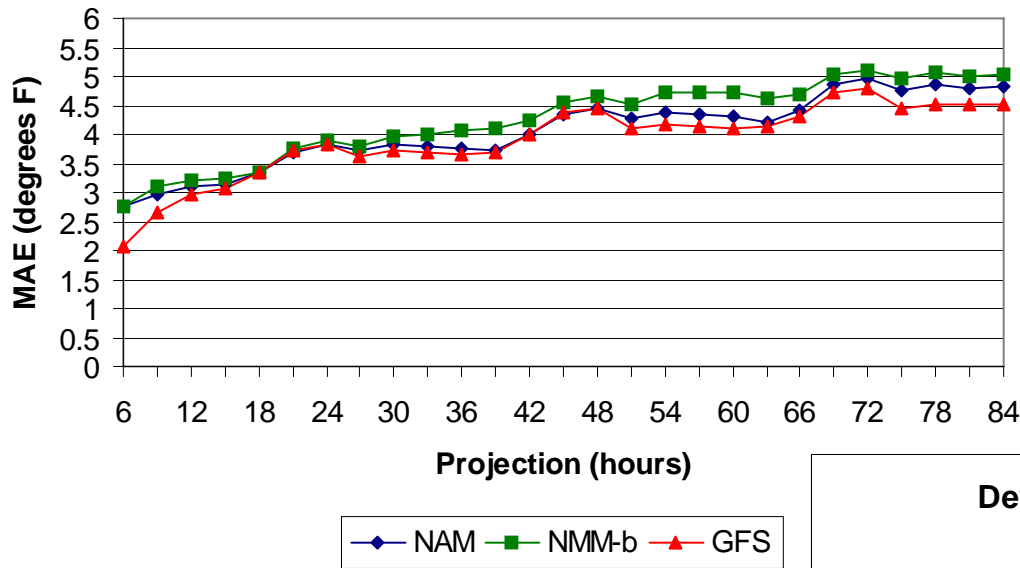
- Overall dry NMM-b bias across all regions. Worse than NAM.
- Differences around 1 degree, especially at later projections
- GFS similar to, or worse than, NMM-b except in Southwest

Dew Point Bias, Overall (335 stations)  
Oct 1, 2010 - March 31, 2011



# Dew Point - Regional

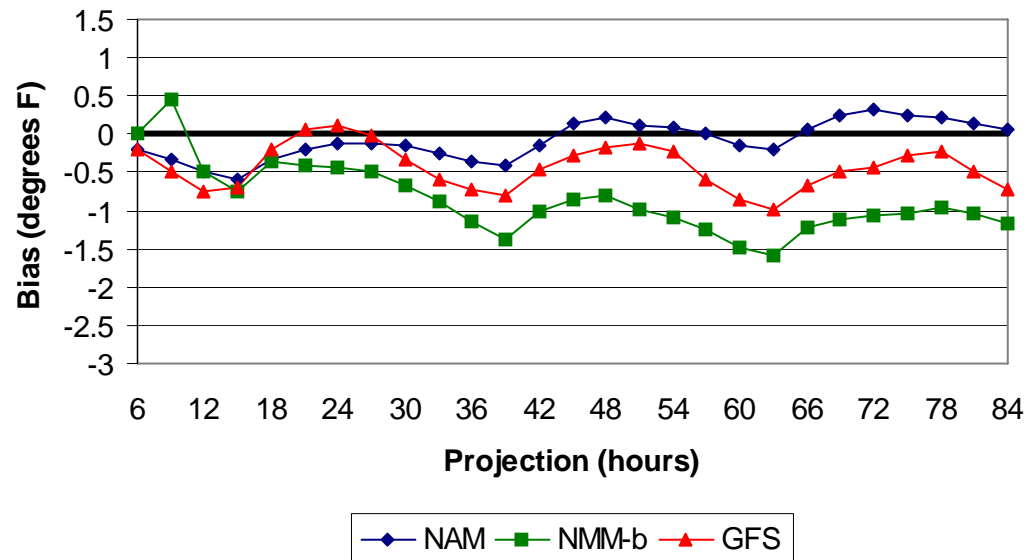
Dew Point MAE, Southwest CONUS (50 stations)  
Oct 1, 2010 - March 31, 2011



- NMM-b MAE similar to, or slightly worse than, NAM for all regions
- Differences < 0.5 degrees

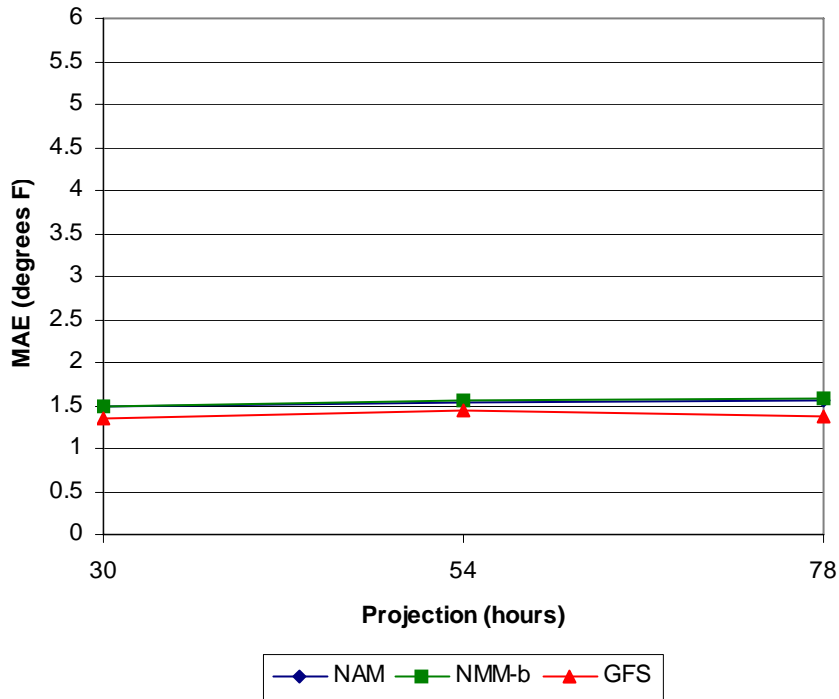
- NMM-b shows a dry bias which is greater than NAM
- Differences as great as 1.5 degrees

Dew Point Bias, Southwest CONUS (50 stations)  
Oct 1, 2010 - March 31, 2011

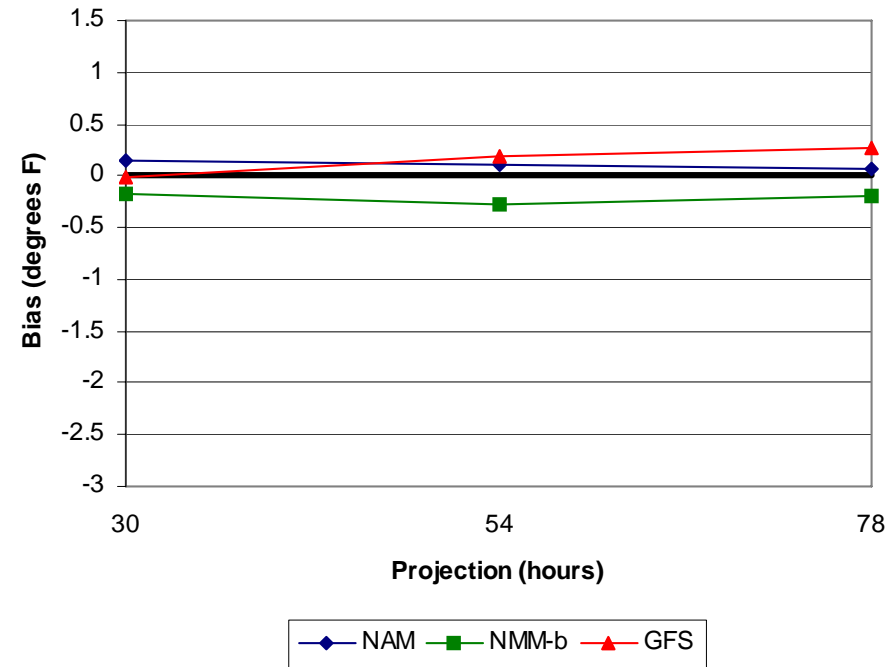


# Maximum Temperature

Max Temp MAE, Hawaii/Puerto Rico  
(5 stations)  
Oct 1, 2010 - March 31, 2011



Max Temp Bias, Hawaii/Puerto Rico  
(5 stations)  
Oct 1, 2010 - March 31, 2011



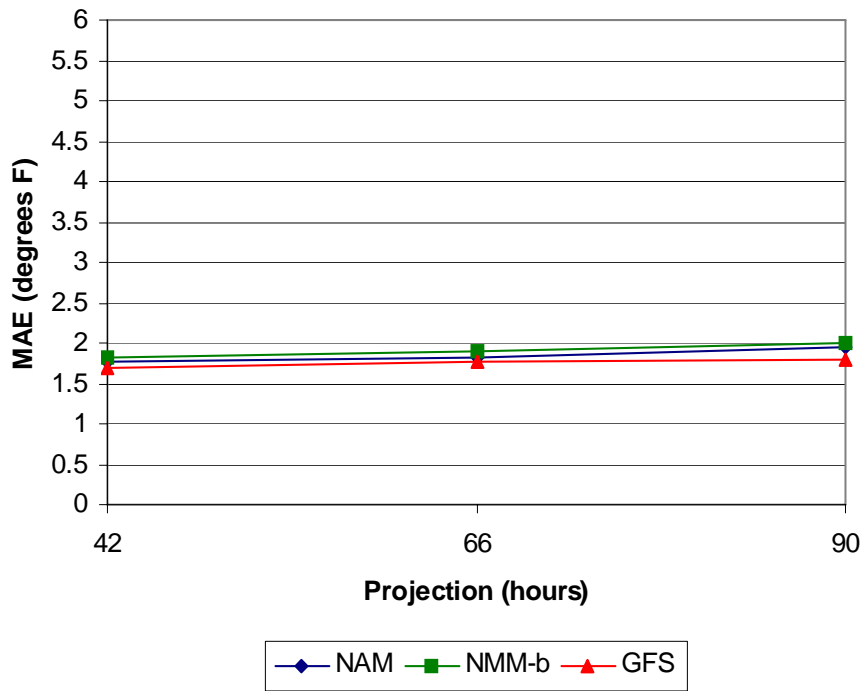
- NMM-b MAE slightly worse than NAM Overall and for CONUS
  - differences < 0.5 degrees
- NMM-b MAE similar to NAM for Alaska & Hawaii

- NMM-b cool bias across all regions with NMM-b worse than NAM by < 1 degree.

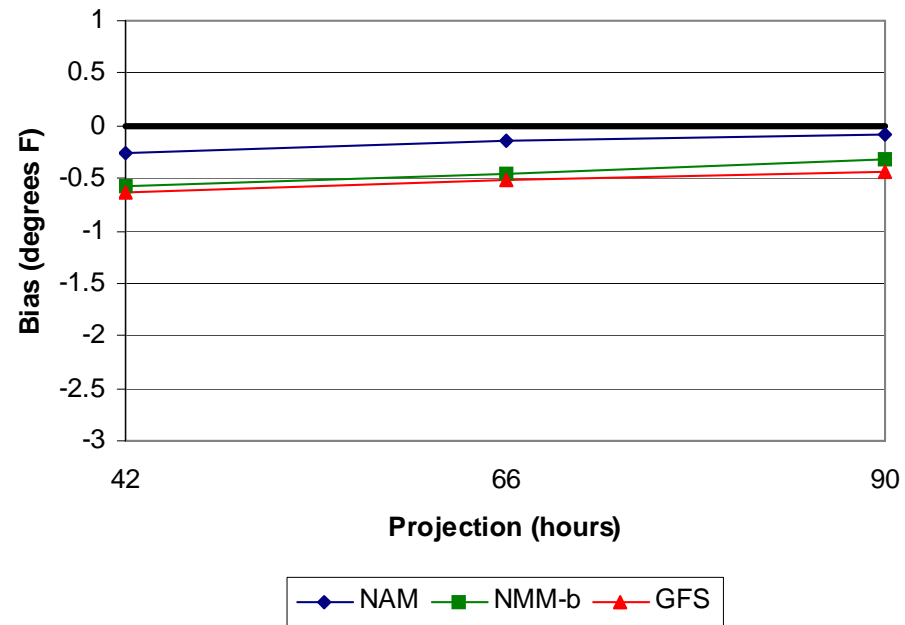


# Minimum Temperature

Min Temp MAE, Hawaii/Puerto Rico (5 stations)  
Oct 1, 2010 - March 31, 2011



Min Temp Bias, Hawaii/Puerto Rico (5 stations)  
Oct 1, 2010 - March 31, 2011

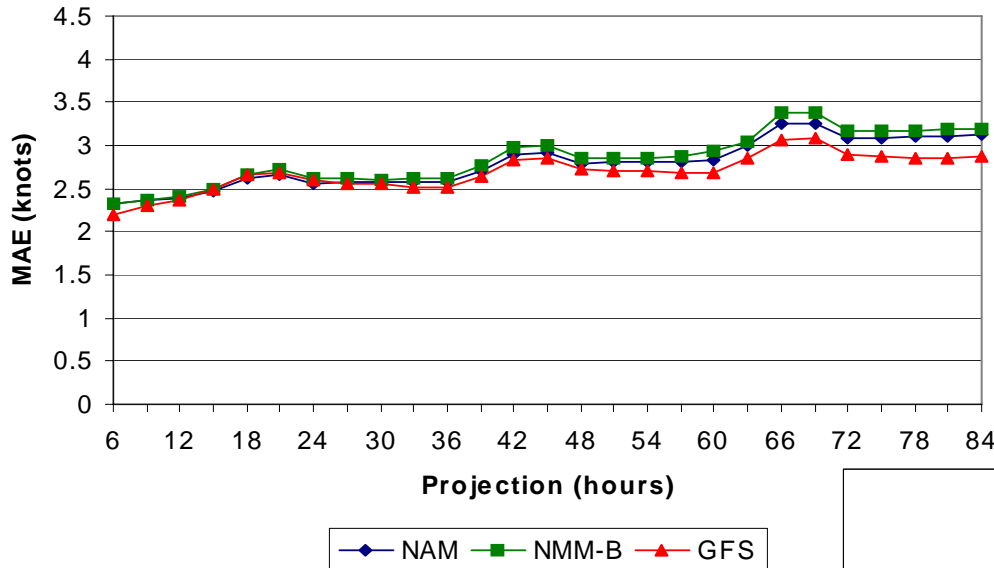


- NMM-b MAE similar to NAM across all regions, worse than GFS

- NMM-b cool bias in all regions
- Differences between NAM and NMM-b around 1 degree.

# Wind Speed

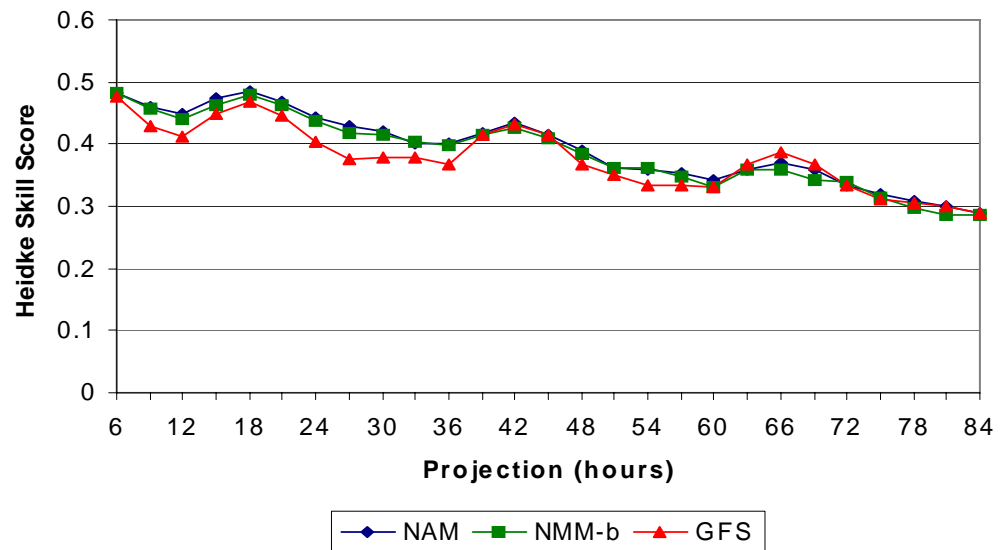
Wind Speed MAE, Overall (335 stations)  
Oct 1, 2010 - March 31, 2011



- Differences between NMM-b and NAM MAE are minimal
- GFS is similar, or slightly better than NAM

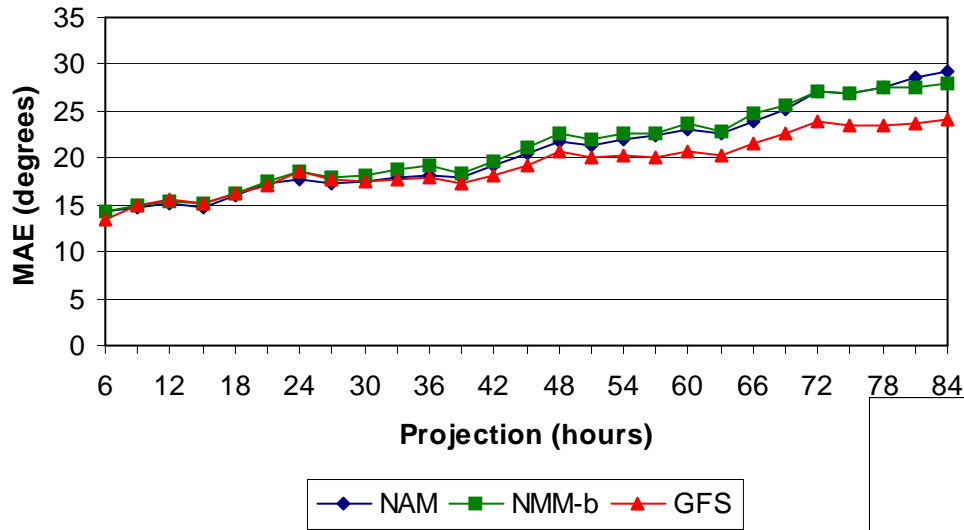
- Skill scores for both NAM models are similar
- Skill for GFS is a bit worse than NAM

Wind Speed HSS, Overall (335 stations)  
Oct 1, 2010 - March 31, 2011



# Wind Direction

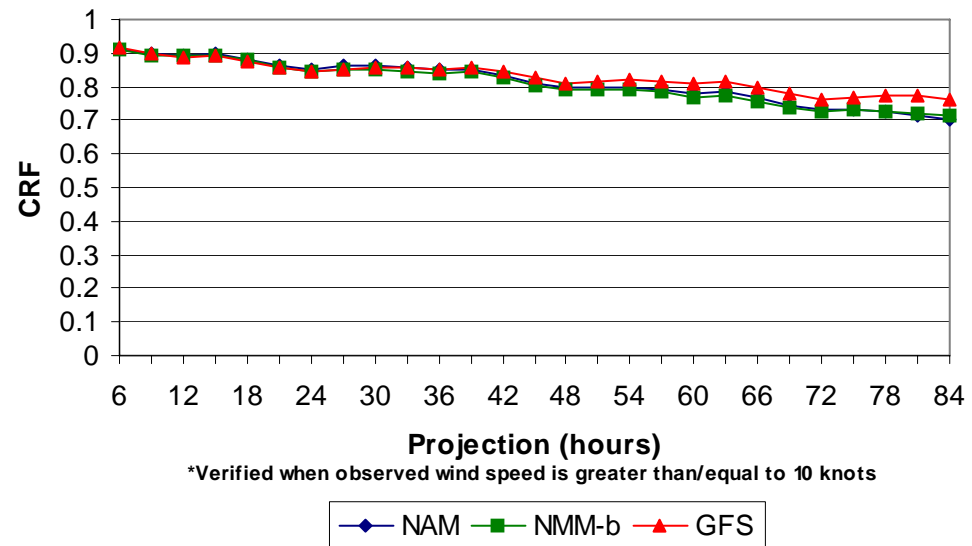
Wind Direction MAE, Overall (335 stations)  
Oct 1, 2010 - March 31, 2011



- NMM-b MAE very similar to NAM
- GFS slightly better than NAM models

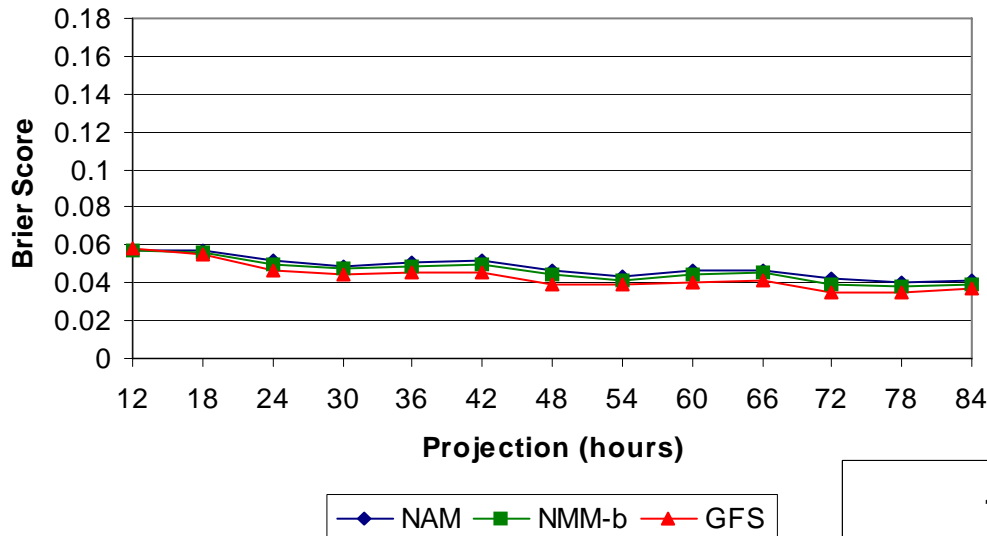
- CRF similar for all models across all regions

Cumulative Relative Frequency of errors less than/equal to 30 degrees - Wind Direction  
Overall (335 stations), Oct 1, 2010 - March 31, 2011



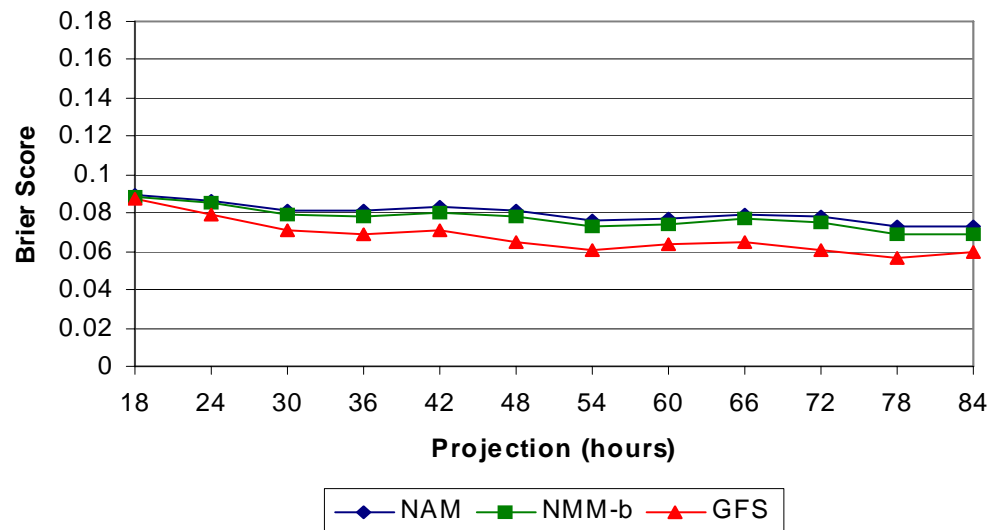
# 6 & 12 hour Precipitation

6 hr Precip Brier Score, Overall (335 stations)  
Oct 1, 2010 - March 31, 2011



- Brier Scores are similar Overall and CONUS, NMM-b slightly lower than NAM for Alaska & Hawaii
- GFS Brier Score is lower than NAM

12 hr Precip Brier Score, Overall (335 stations)  
Oct 1, 2010 - March 31, 2011



# Cool Season Overall Summary

- Cool season changes associated with the NMM-b implementation are very similar to warm season, and in some cases, slightly exaggerated
  - Potential for a possible temperature redevelopment?
- Bias wise, GFS bias is worse than NMM-b with a stronger diurnal cycle
- NAM performance advantage over GFS seems to be lost with the implementation