Verification of
CCS GFS MOS vs. WCOSS GFS MOS
CCS NAM MOS vs. WCOSS NAM MOS

May 9, 2013 – May 31, 2013 0000 UTC cycle

<u>Station Sample</u>:

CONUS + OCONUS – 1440 Stations

Alaska – 110 Stations

Office of Science and Technology, Meteorological Development Lab

Evaluation completed: 6/12/13

Verification of
CCS GFS MOS vs. WCOSS GFS MOS
CCS NAM MOS vs. WCOSS NAM MOS

Weather Elements:

2M – Temperature (°F)

2M – Dewpoint (°F)

Daytime Maximum Temperature (°F)

Nighttime Minimum Temperature (°F)

Wind Speed (Kts)

06-h Probability of Precip. (PoP - %)

12-h PoP (%)

Projection Hours:

6hr – 84hr (NAM)

6hr – 192hr (GFS)

Metrics:

BIAS

MAE

BRIER SCORE

CCS GFS MOS vs. WCOSS GFS MOS

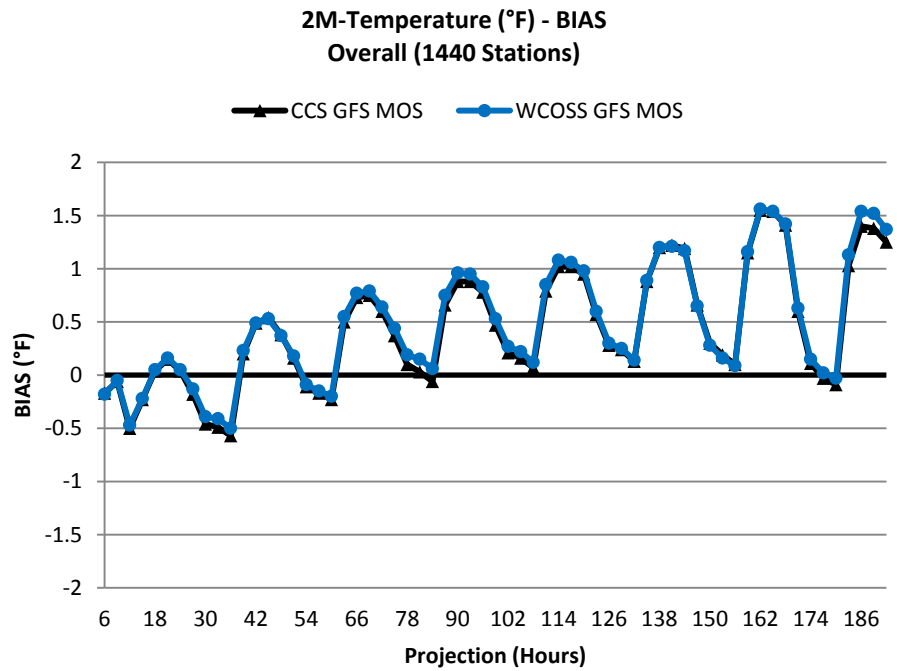
May 9, 2013 – May 31, 2013
0000 UTC Cycle

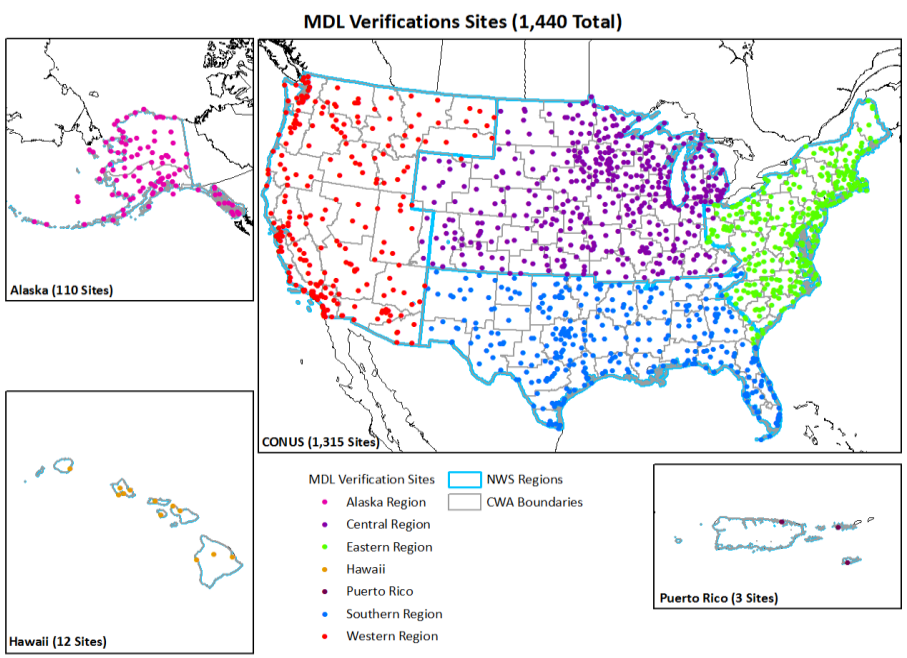
Weather Element:
2M - Temperature (°F)

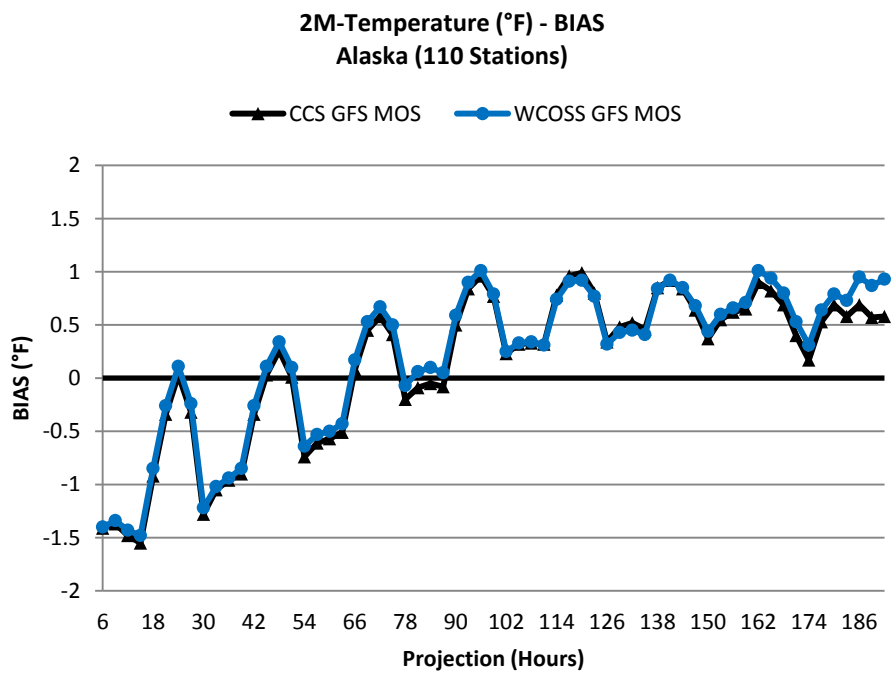
Metric:
BIAS

Projection Hours:
6hr – 192hr (Every 3 hrs)

Station Sample:
CONUS + OCONUS – 1440 Stations
Alaska – 110 Stations







CCS GFS MOS vs. WCOSS GFS MOS

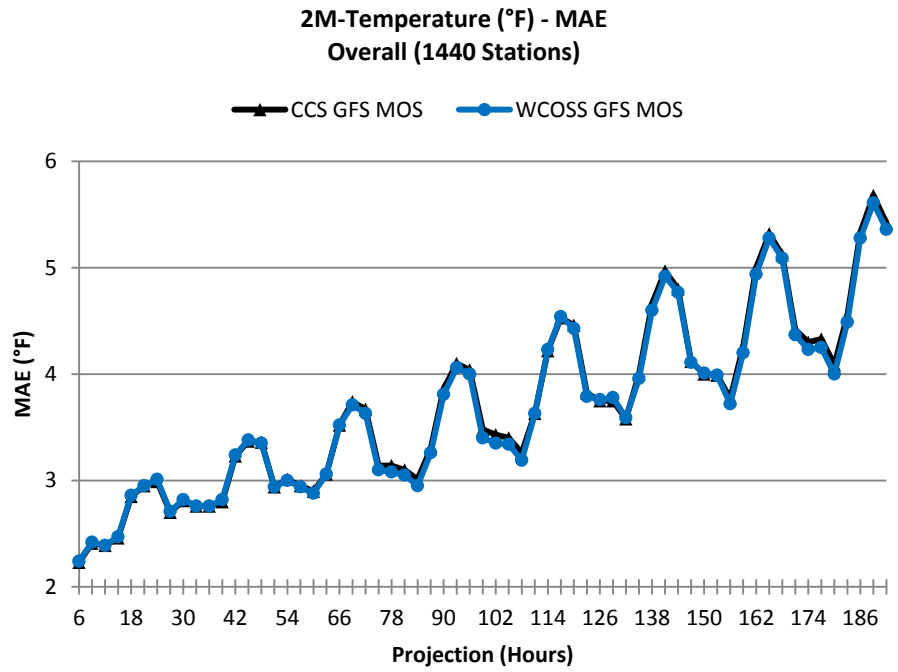
May 9, 2013 – May 31, 2013
0000 UTC Cycle

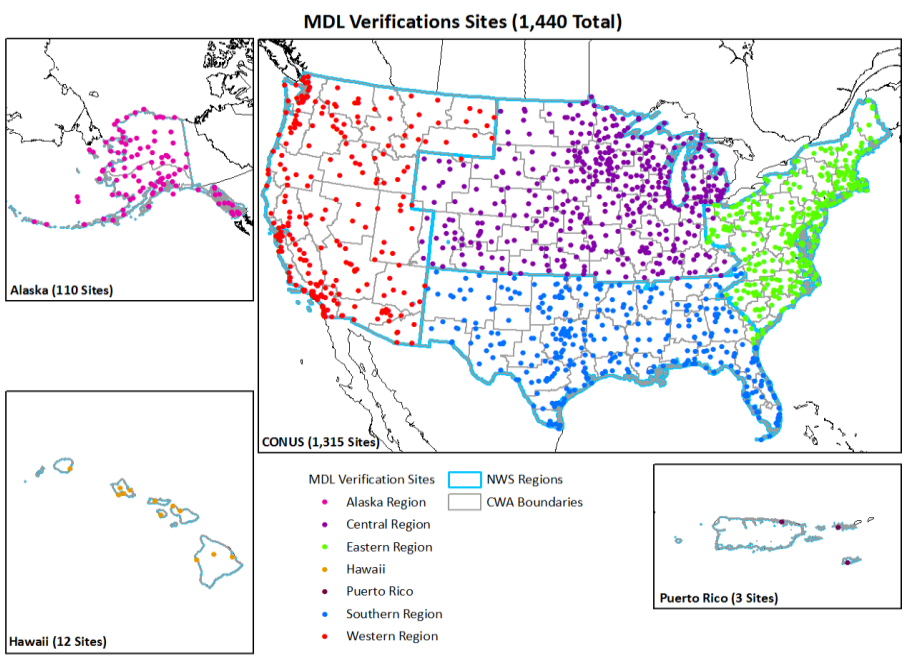
Weather Element:
2M - Temperature (°F)

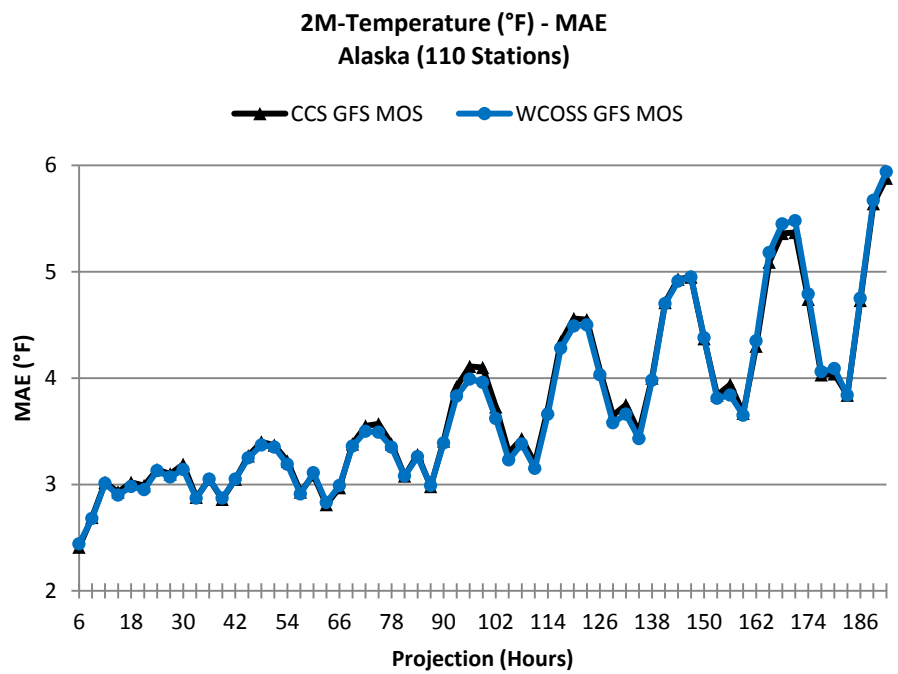
Metric:
MAE

Projection Hours:
6hr – 192hr (Every 3 hrs)

Station Sample:
CONUS + OCONUS – 1440 Stations
Alaska – 110 Stations







CCS GFS MOS vs. WCOSS GFS MOS

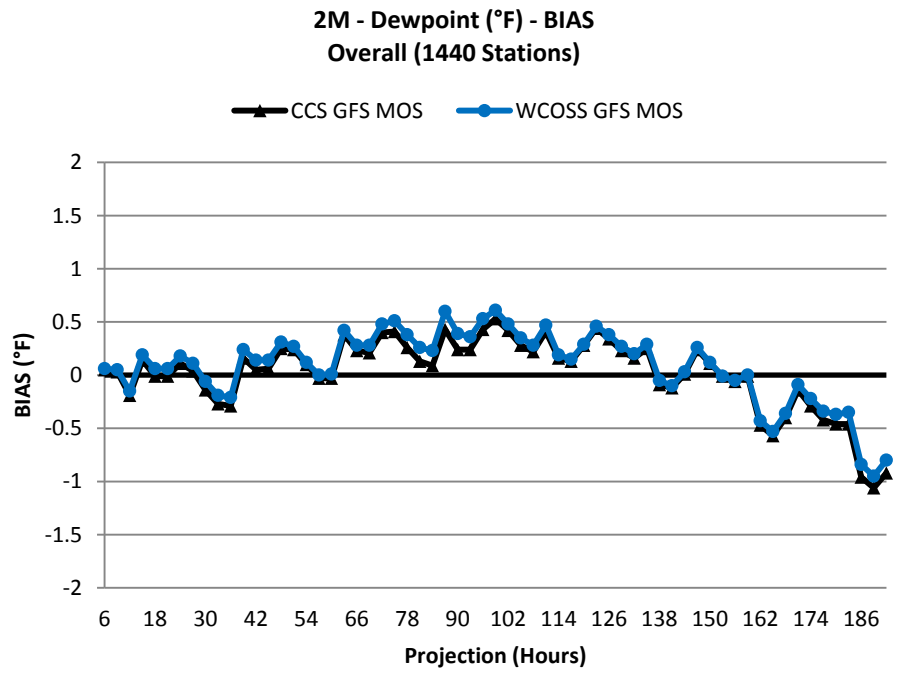
May 9, 2013 – May 31, 2013
0000 UTC Cycle

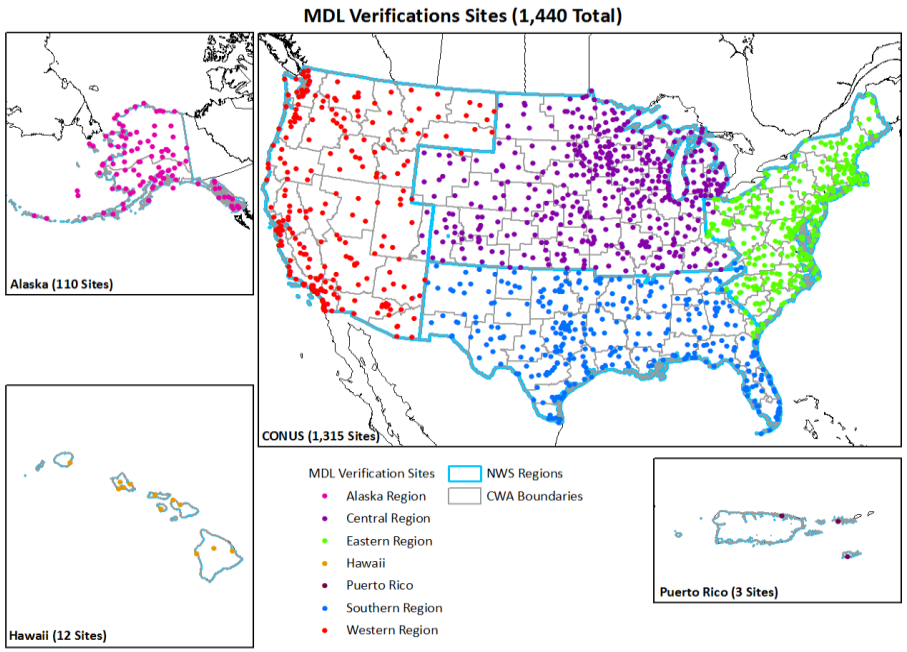
Weather Element:
2M - Dewpoint (°F)

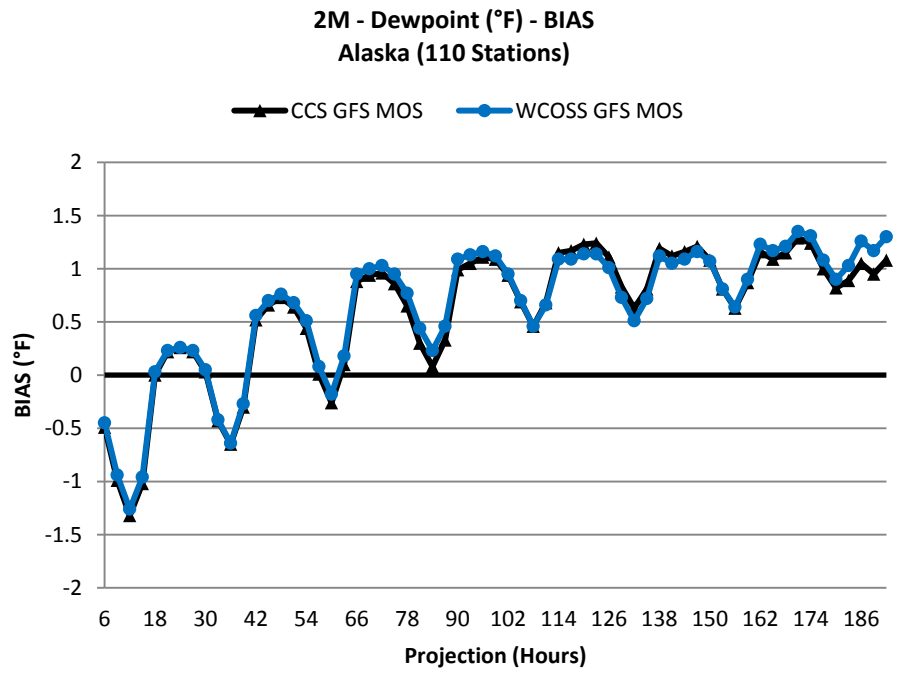
Metric:
BIAS

Projection Hours:
6hr – 192hr (Every 3 hrs)

Station Sample:
CONUS + OCONUS – 1440 Stations
Alaska – 110 Stations







CCS GFS MOS vs. WCOSS GFS MOS

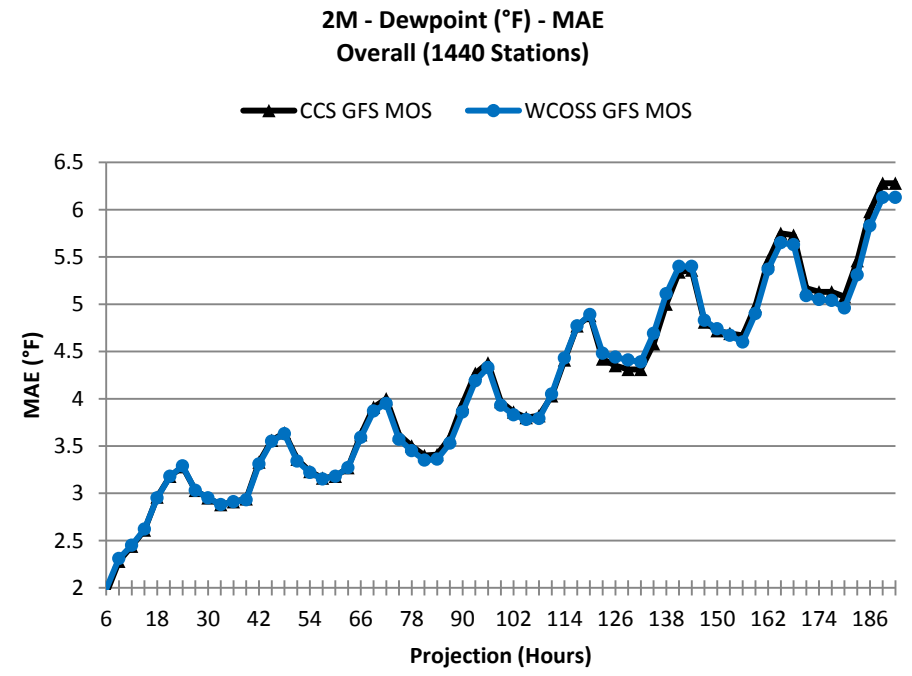
May 9, 2013 – May 31, 2013
0000 UTC Cycle

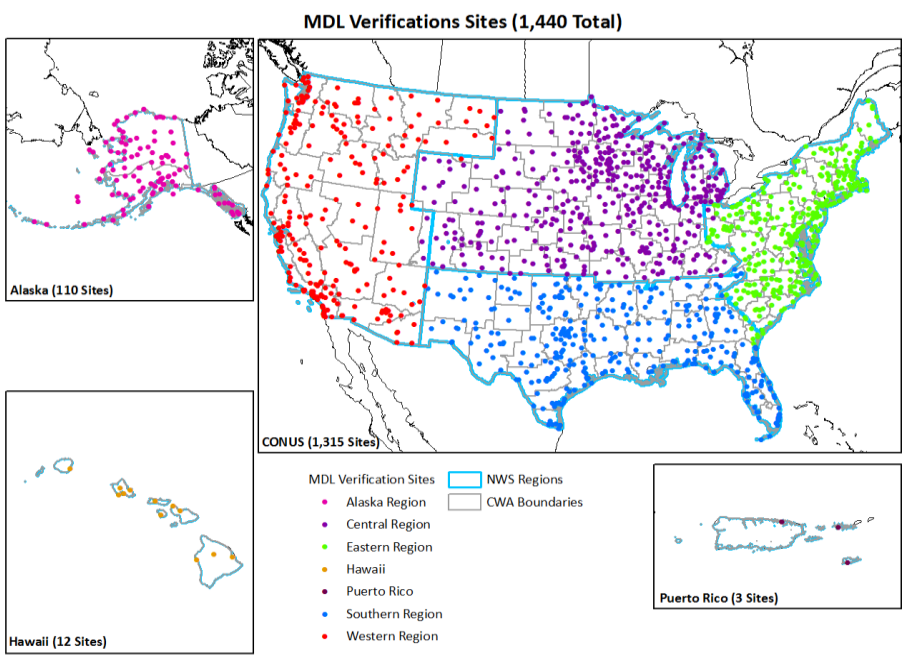
Weather Element:
2M - Dewpoint (°F)

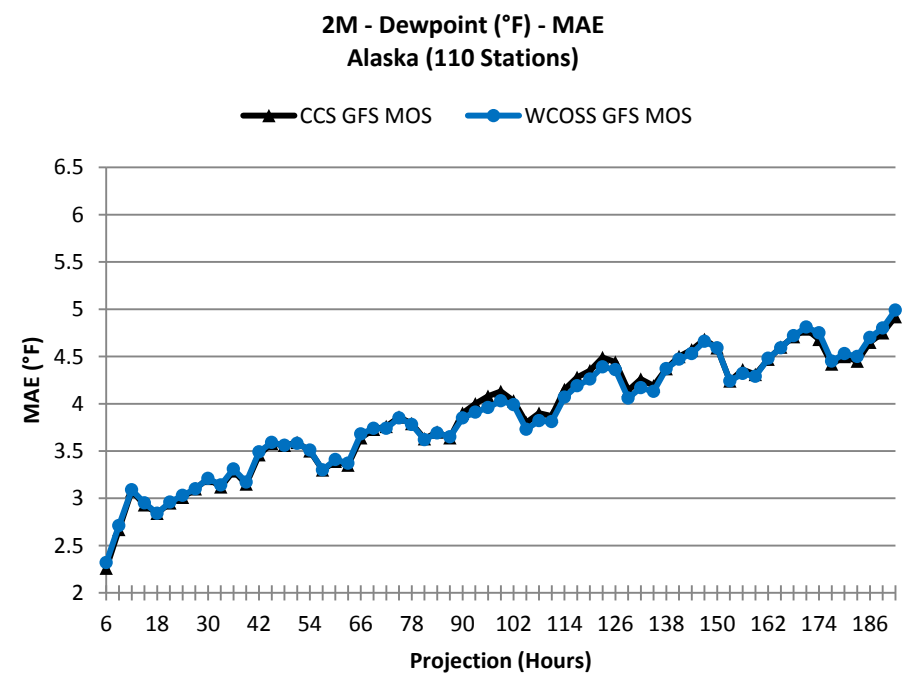
Metric:
MAE

Projection Hours:
6hr – 192hr (Every 3 hrs)

Station Sample:
CONUS + OCONUS – 1440 Stations
Alaska – 110 Stations







CCS GFS MOS vs. WCOSS GFS MOS

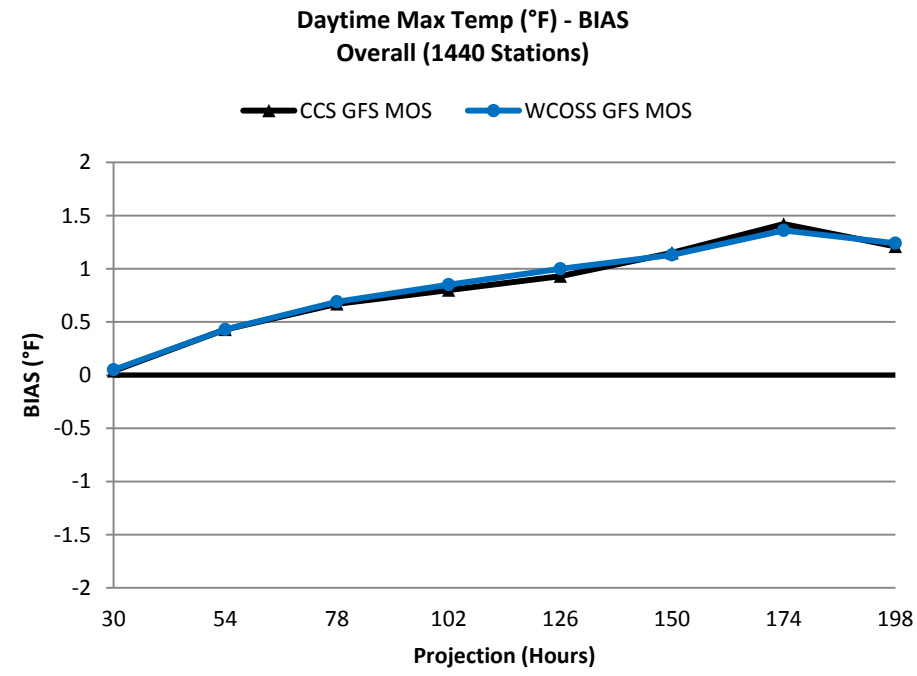
May 9, 2013 – May 31, 2013
0000 UTC Cycle

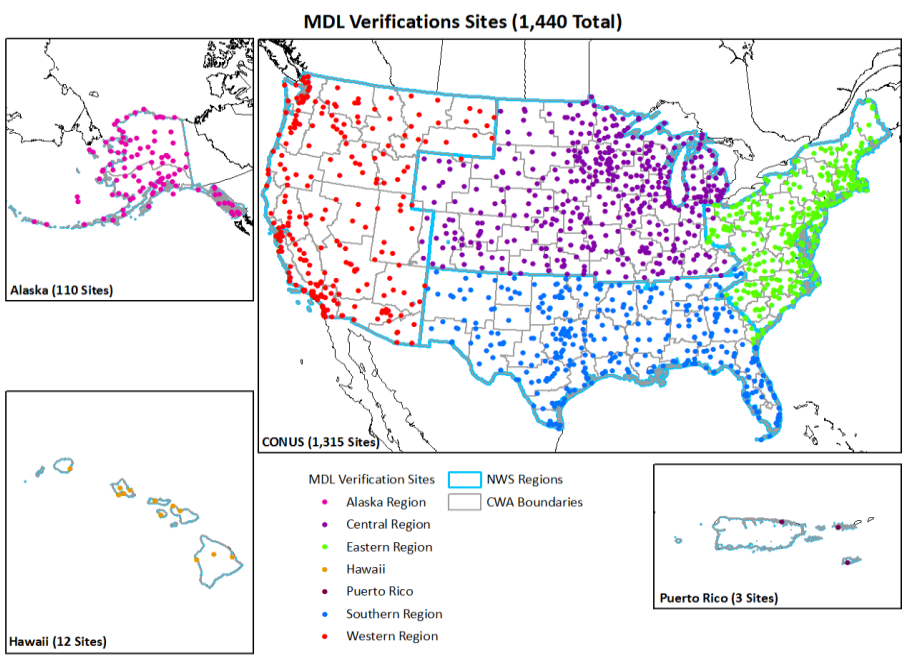
Weather Element:
Daytime Max Temperature (°F)

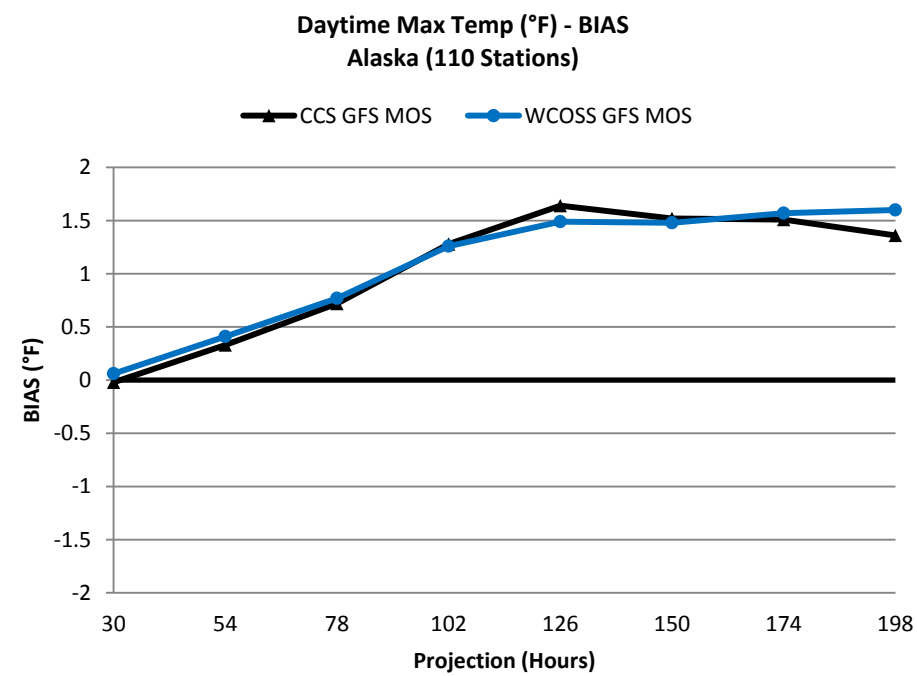
Metric:
BIAS

Projection Hours:
6hr – 192hr (Every 3 hrs)

Station Sample:
CONUS + OCONUS – 1440 Stations
Alaska – 110 Stations







CCS GFS MOS vs. WCOSS GFS MOS

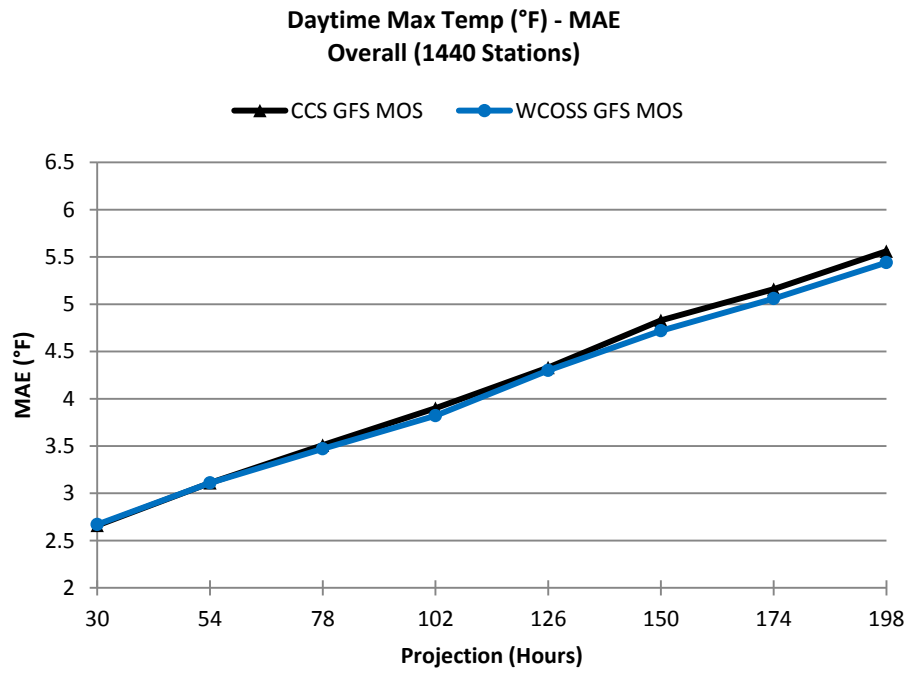
May 9, 2013 – May 31, 2013
0000 UTC Cycle

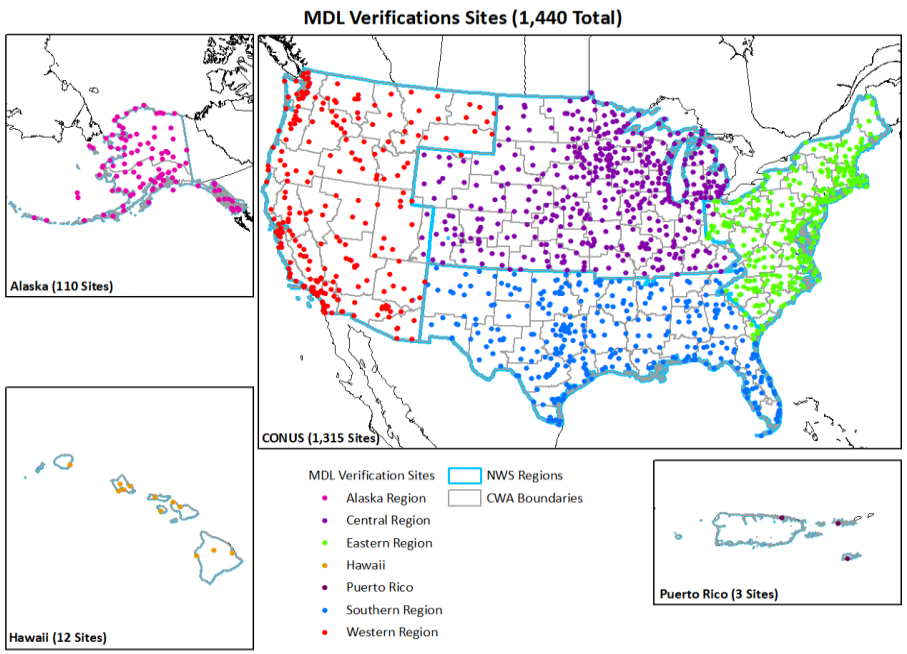
Weather Element:
Daytime Max Temperature (°F)

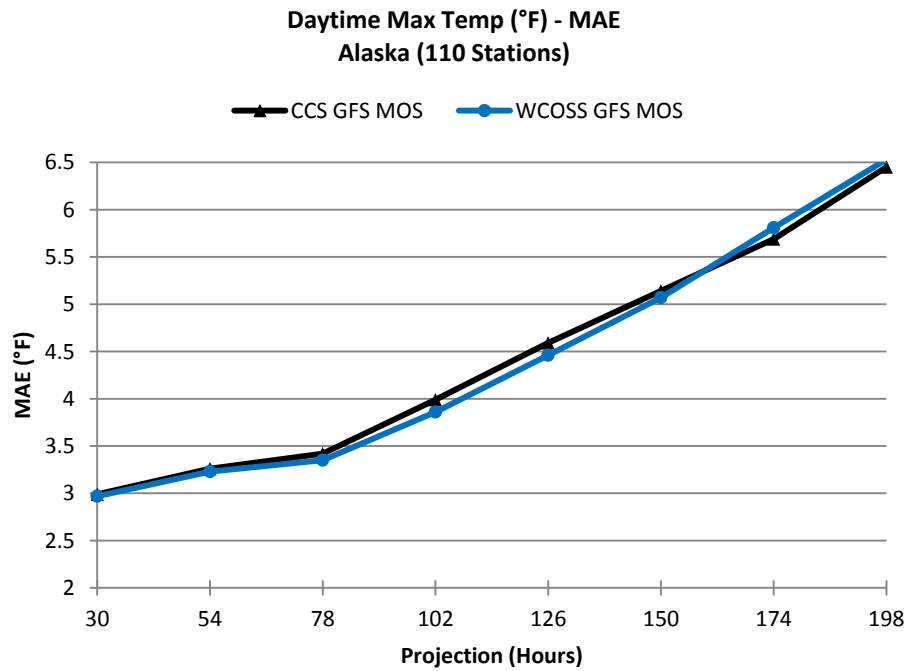
Metric:
MAE

Projection Hours:
6hr – 192hr (Every 3 hrs)

Station Sample:
CONUS + OCONUS – 1440 Stations
Alaska – 110 Stations







CCS GFS MOS vs. WCOSS GFS MOS

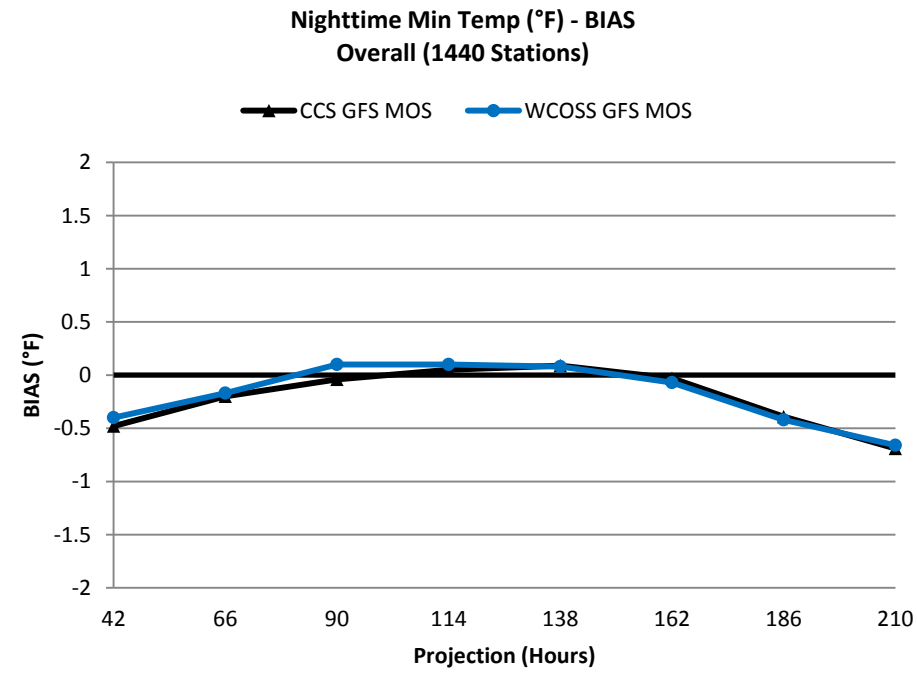
May 9, 2013 – May 31, 2013
0000 UTC Cycle

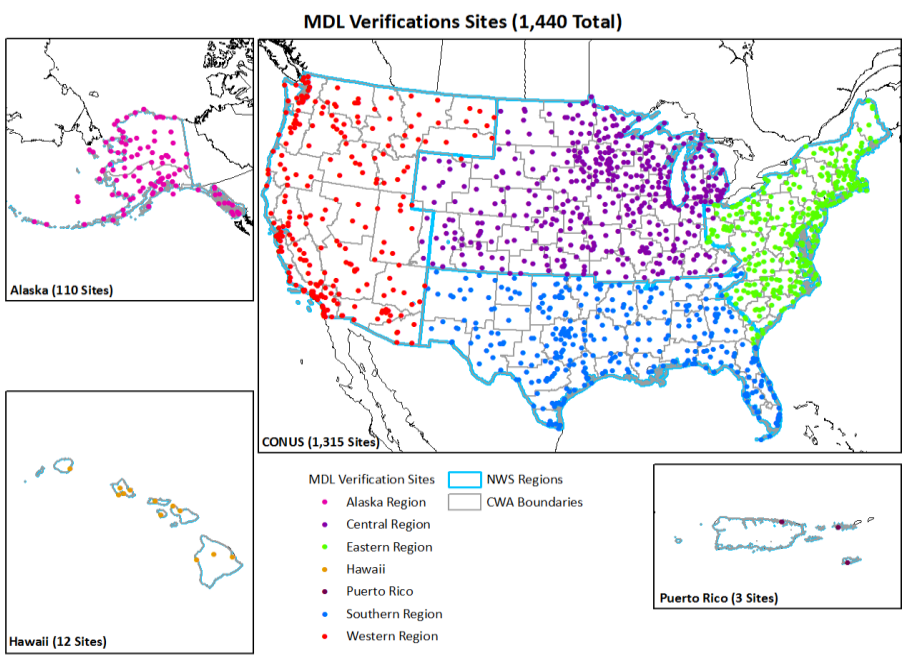
Weather Element:
Nighttime Min Temperature (°F)

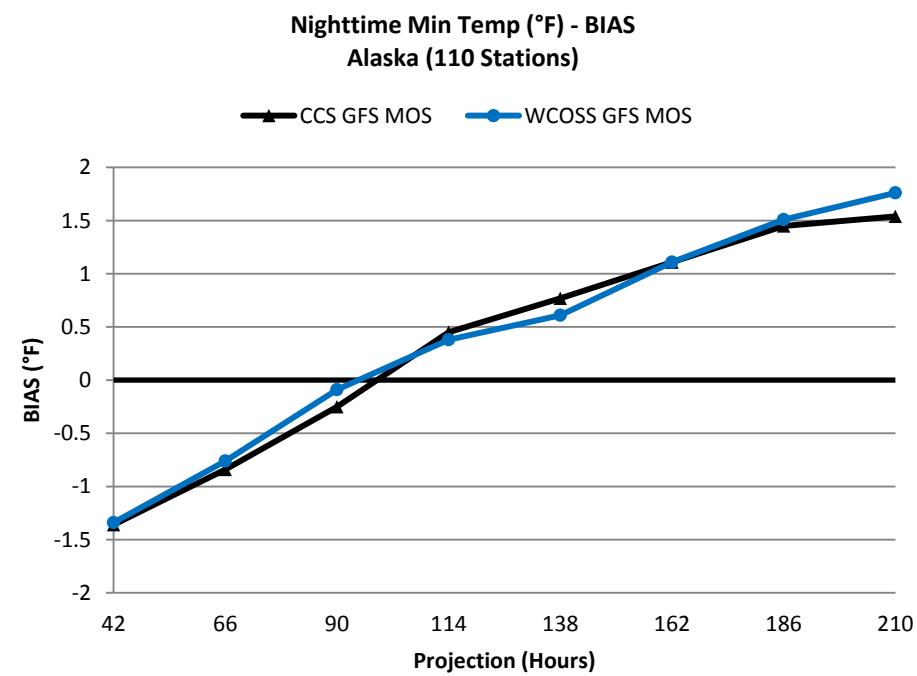
Metric:
BIAS

Projection Hours:
6hr – 192hr (Every 3 hrs)

Station Sample:
CONUS + OCONUS – 1440 Stations
Alaska – 110 Stations







CCS GFS MOS vs. WCOSS GFS MOS

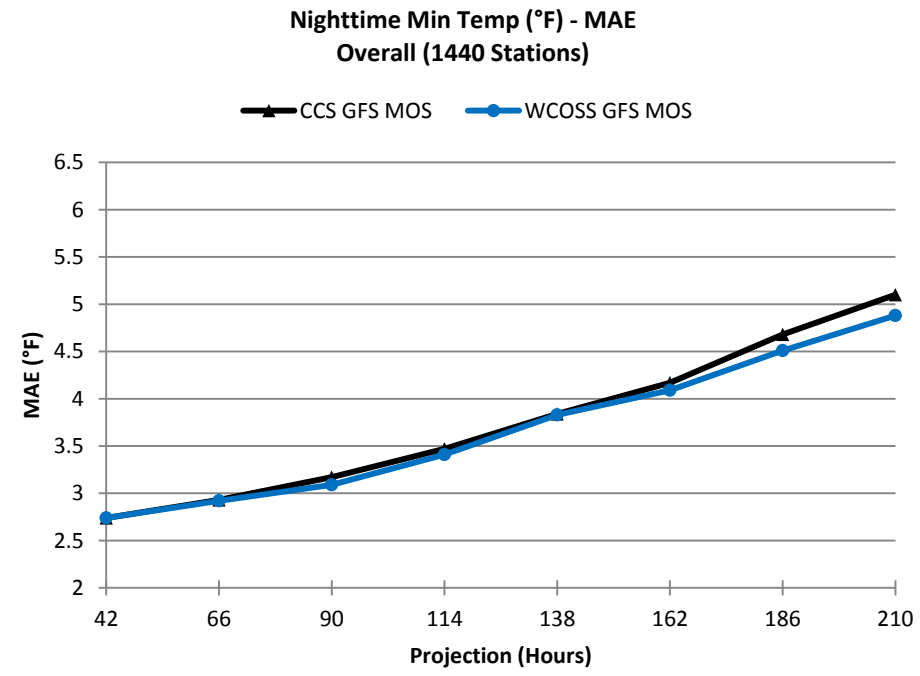
May 9, 2013 – May 31, 2013
0000 UTC Cycle

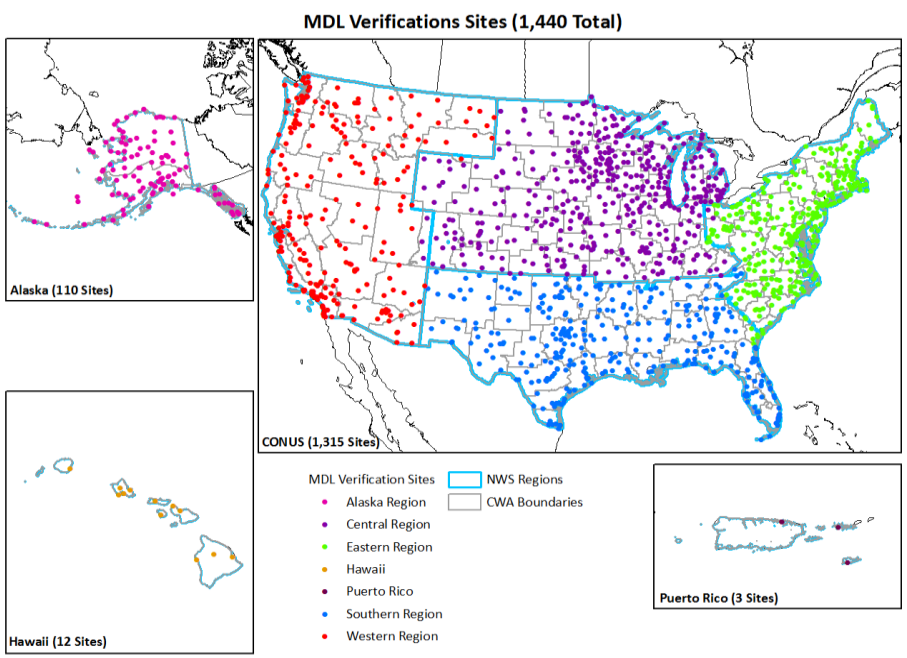
Weather Element:
Nighttime Min Temperature (°F)

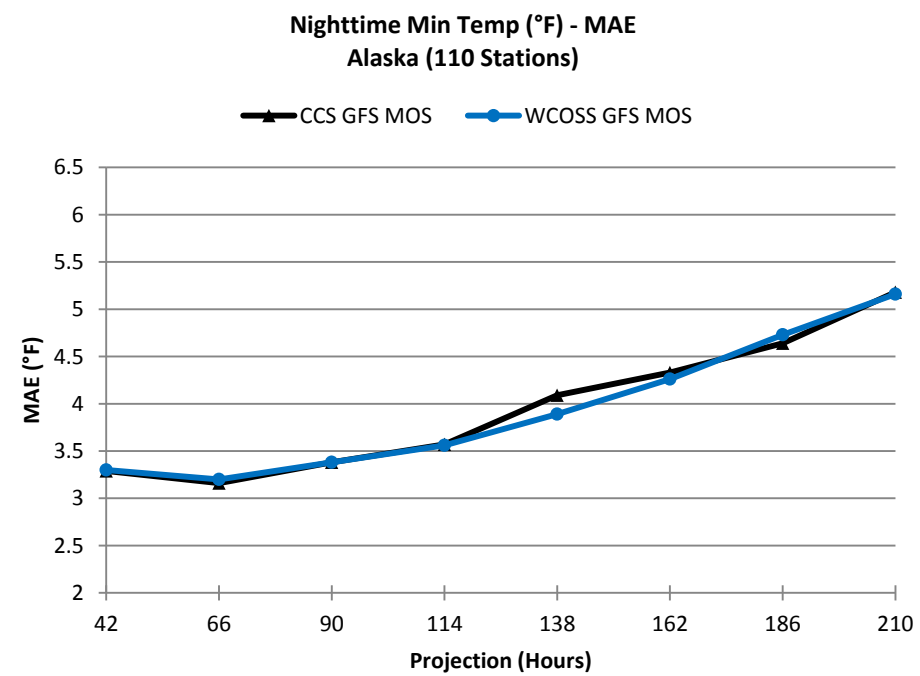
Metric:
MAE

Projection Hours:
6hr – 192hr (Every 3 hrs)

Station Sample:
CONUS + OCONUS – 1440 Stations
Alaska – 110 Stations







CCS GFS MOS vs. WCOSS GFS MOS

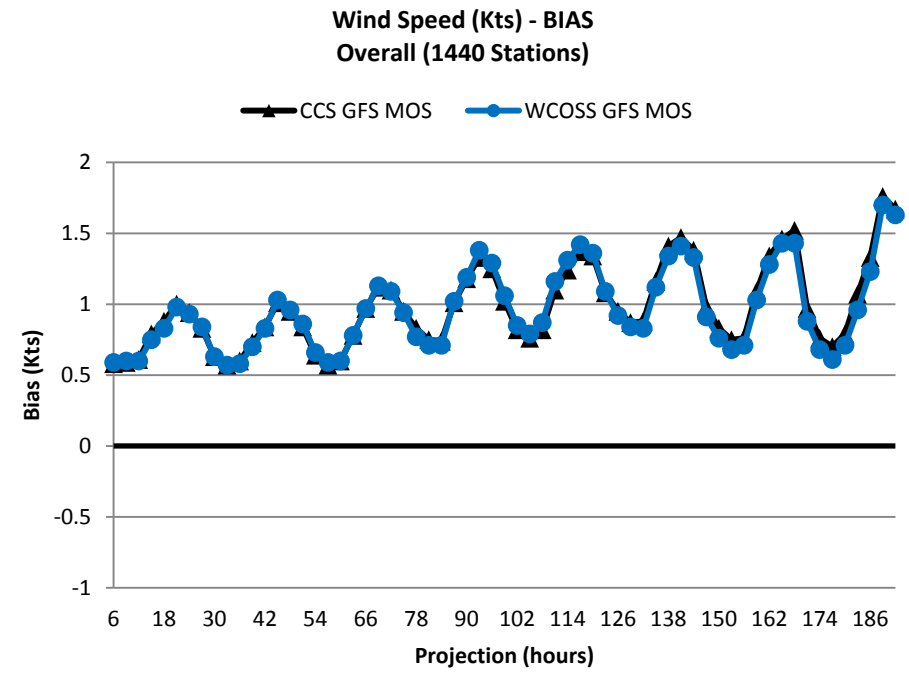
May 9, 2013 – May 31, 2013
0000 UTC Cycle

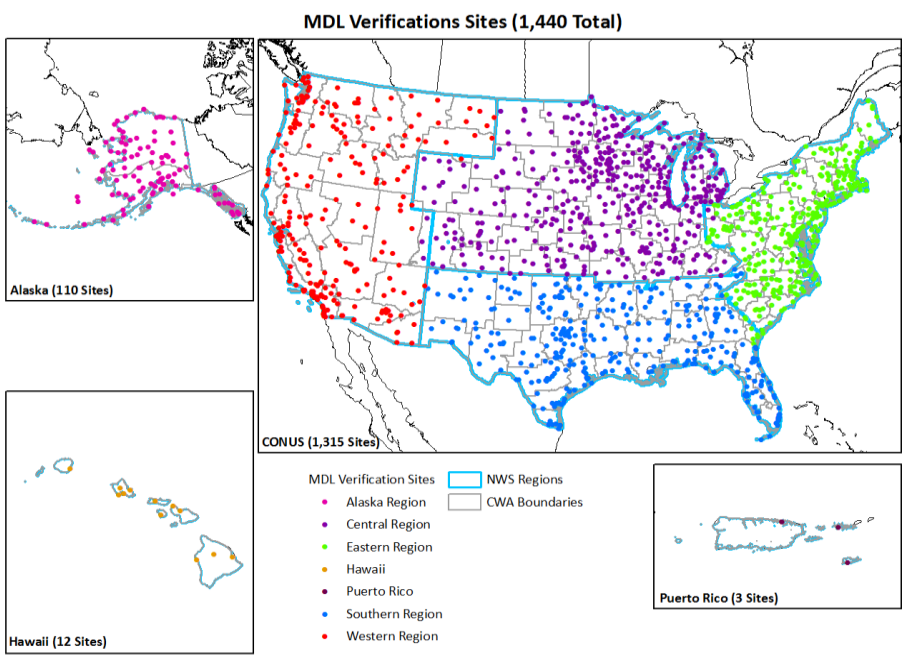
Weather Element:
Wind Speed (Kts)

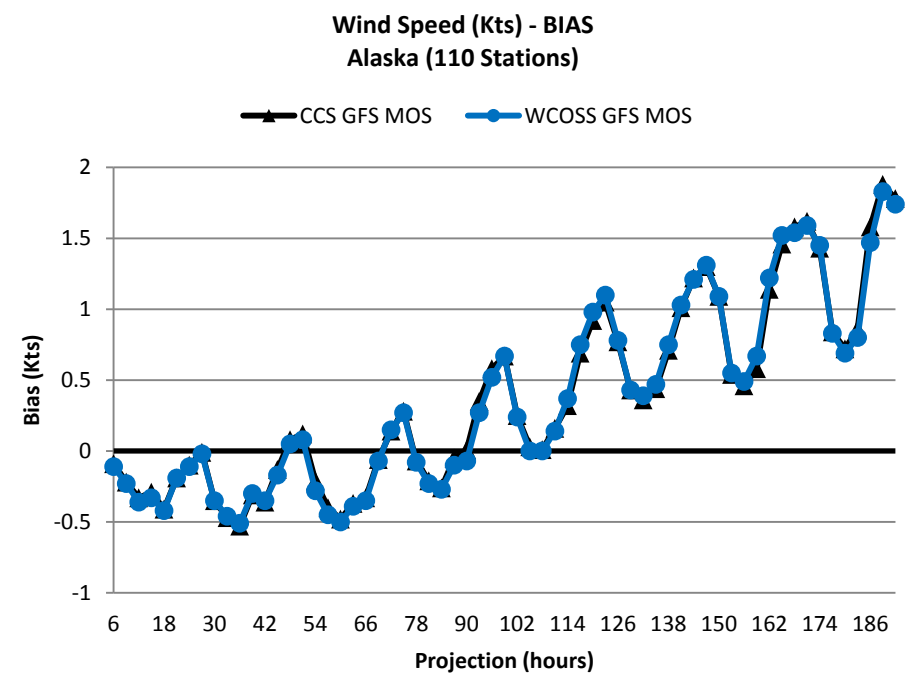
Metric:
BIAS

Projection Hours:
6hr – 192hr (Every 3 hrs)

Station Sample:
CONUS + OCONUS – 1440 Stations
Alaska – 110 Stations







CCS GFS MOS vs. WCOSS GFS MOS

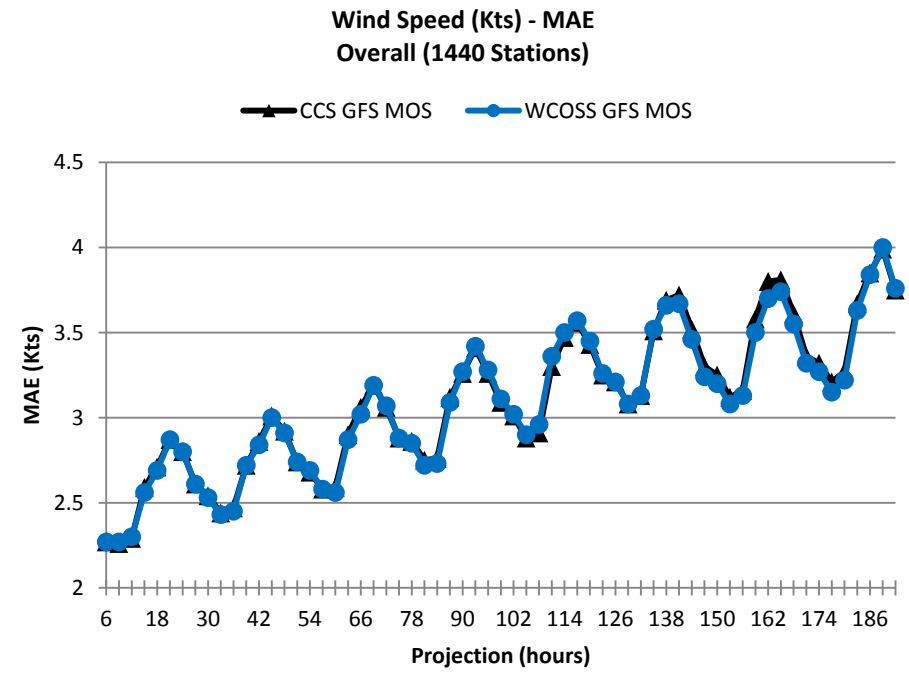
May 9, 2013 – May 31, 2013
0000 UTC Cycle

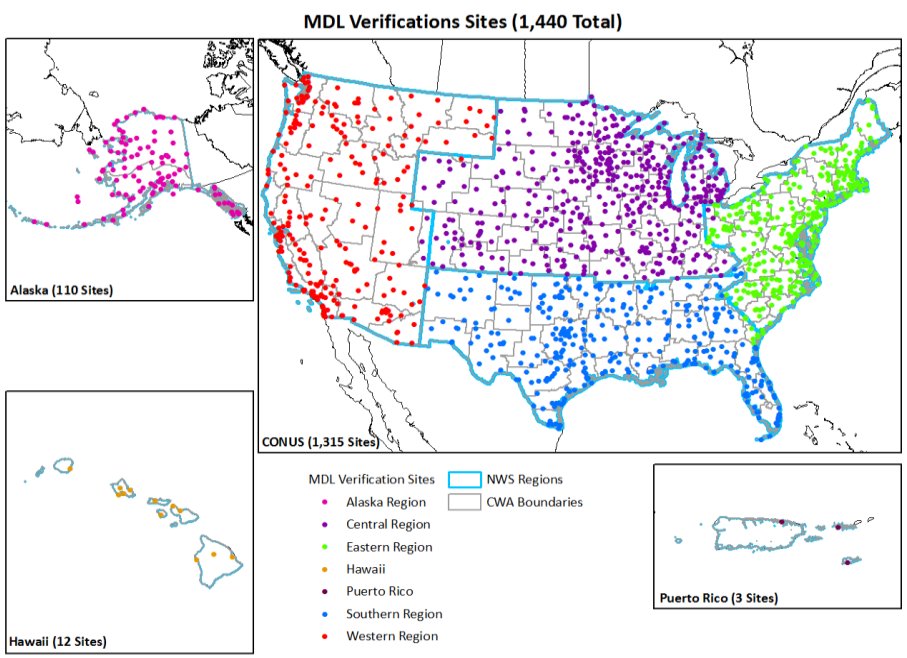
Weather Element:
Wind Speed (Kts)

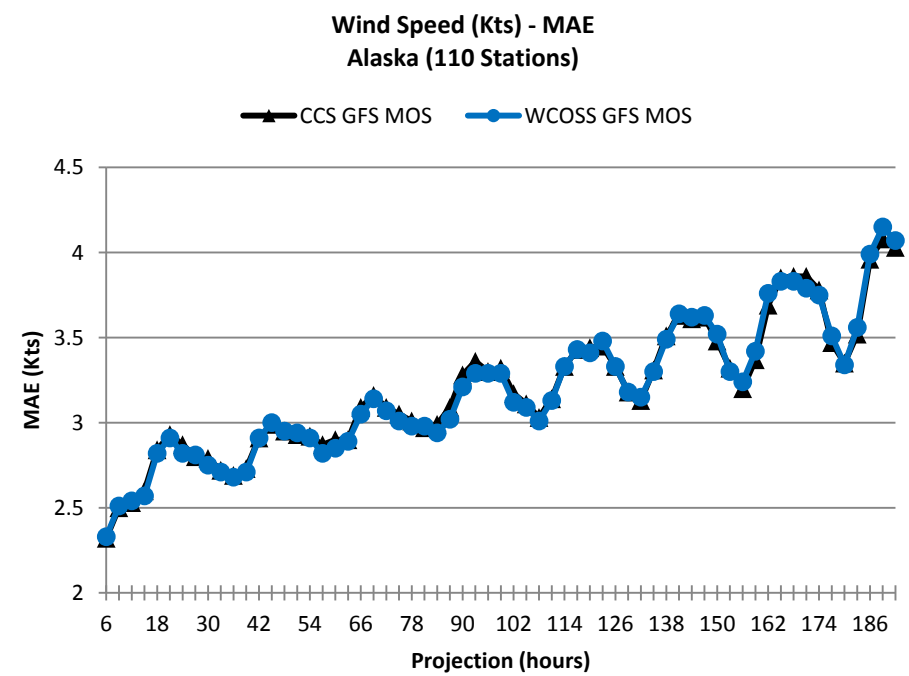
Metric:
MAE

Projection Hours:
6hr – 192hr (Every 3 hrs)

Station Sample:
CONUS + OCONUS – 1440 Stations
Alaska – 110 Stations







CCS GFS MOS vs. WCOSS GFS MOS

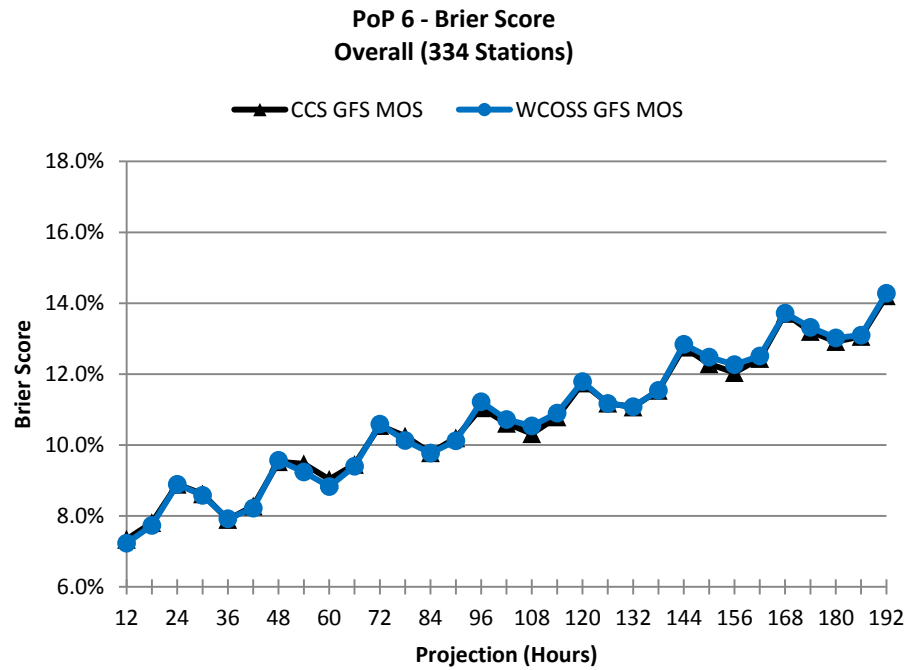
May 9, 2013 – May 31, 2013
0000 UTC Cycle

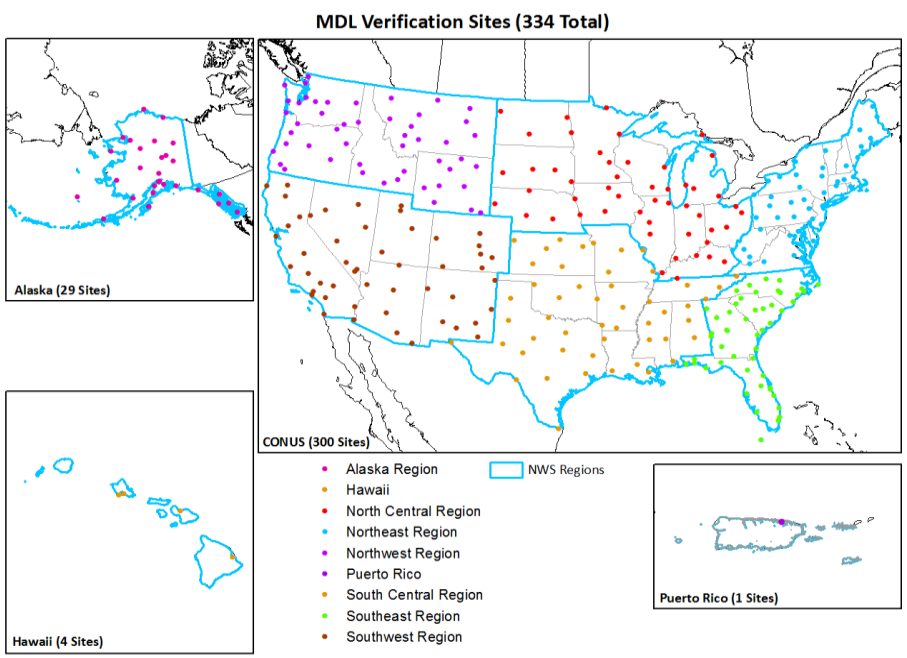
Weather Element:
PoP 6 & PoP 12

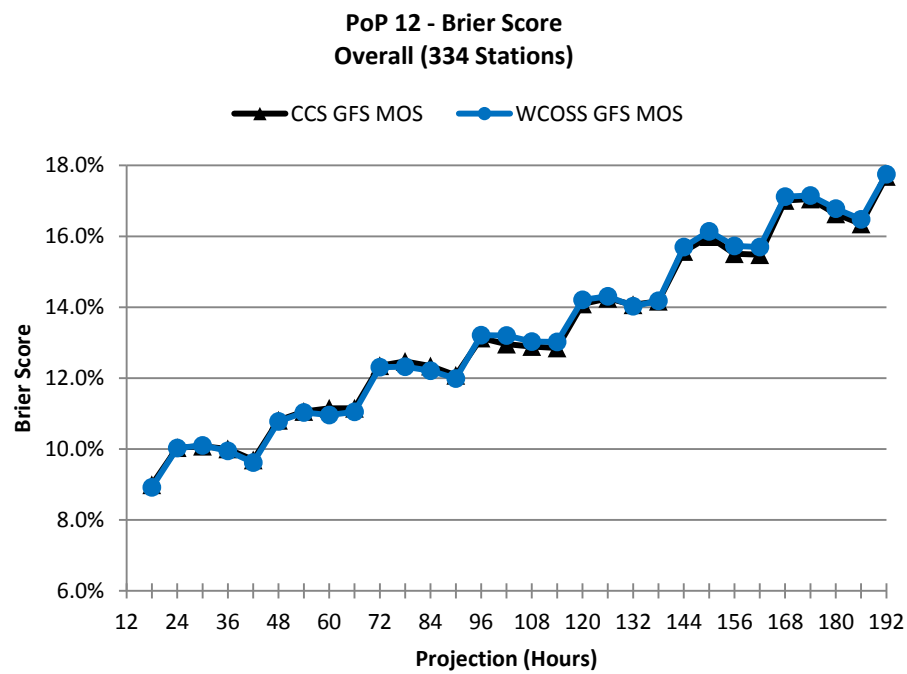
Metric:
Brier Score

Projection Hours:
6hr – 192hr (Every 6 hrs)

Station Sample:
CONUS + OCONUS – 334 Stations







CCS NAM MOS vs. WCOSS NAM MOS

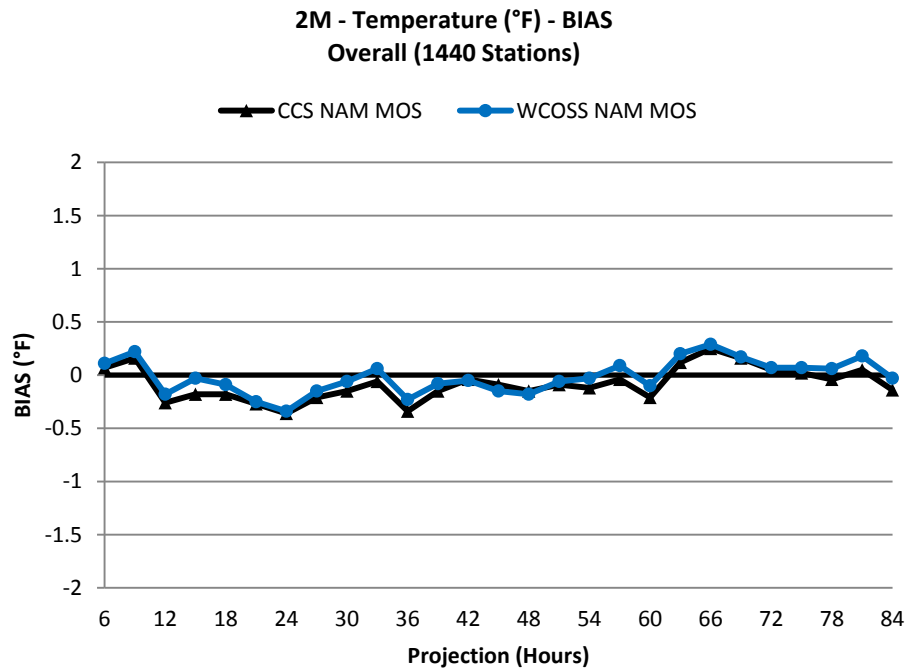
May 9, 2013 – May 31, 2013
0000 UTC Cycle

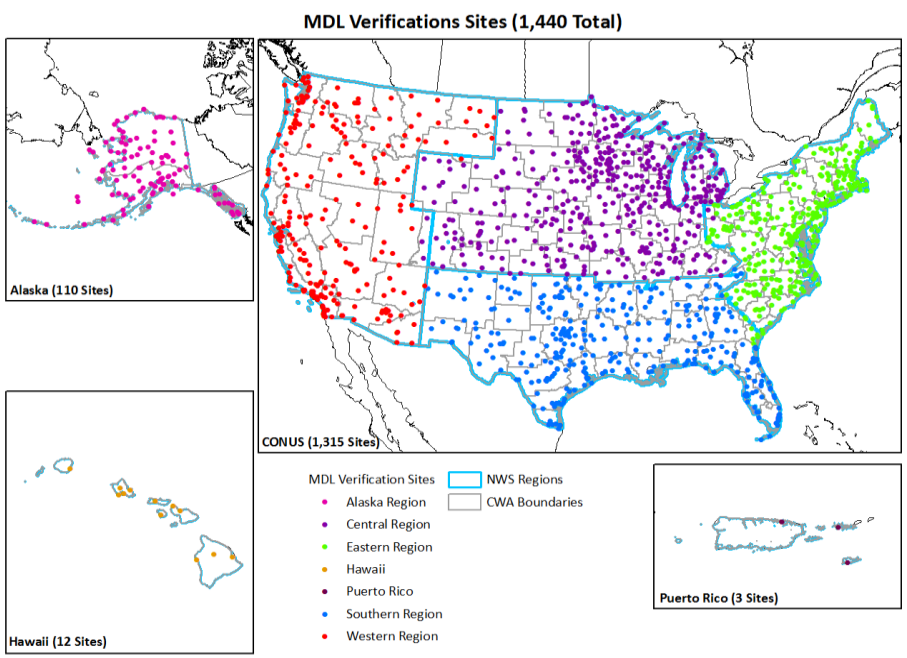
Weather Element:
2M - Temperature (°F)

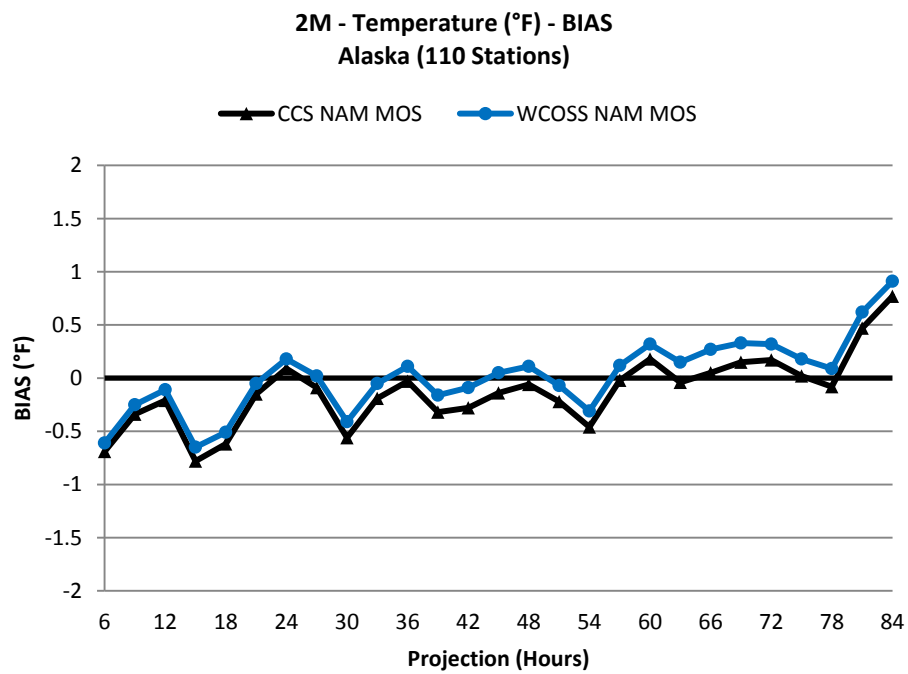
Metric:
BIAS

Projection Hours:
6hr – 84hr (Every 3 hrs)

Station Sample:
CONUS + OCONUS – 1440 Stations
Alaska – 110 Stations







CCS NAM MOS vs. WCOSS NAM MOS

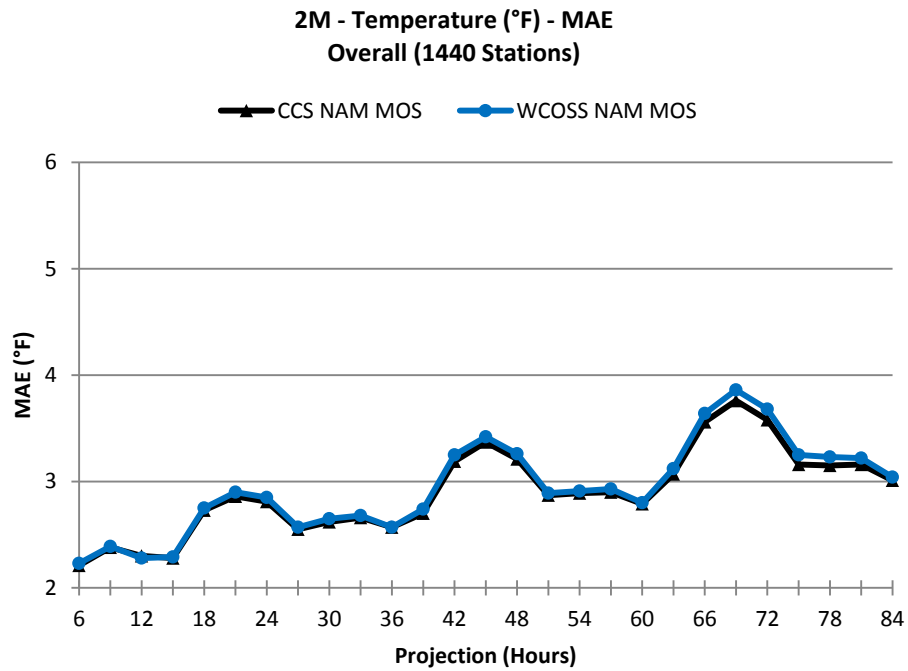
May 9, 2013 – May 31, 2013
0000 UTC Cycle

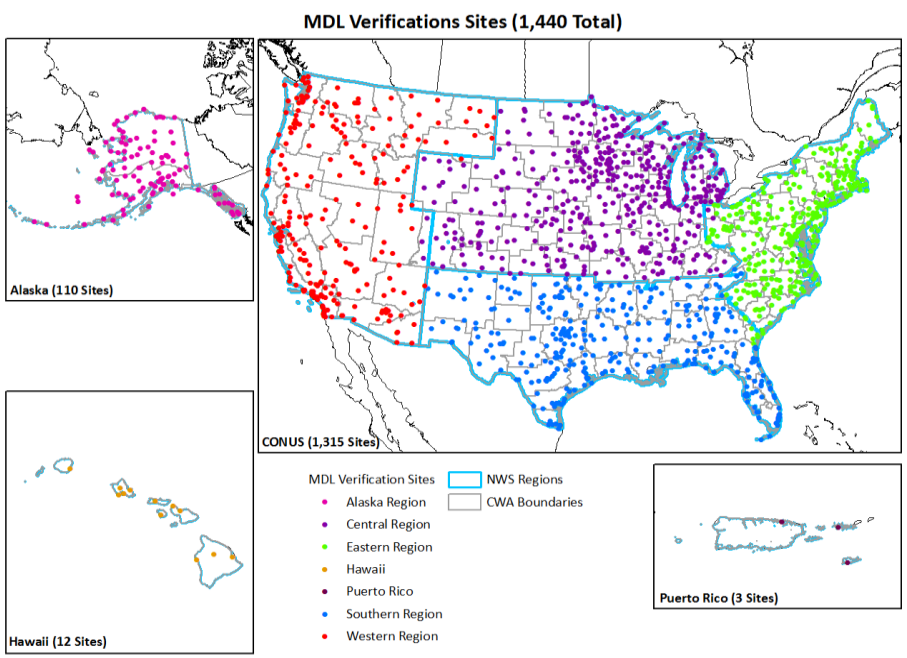
Weather Element:
2M - Temperature (°F)

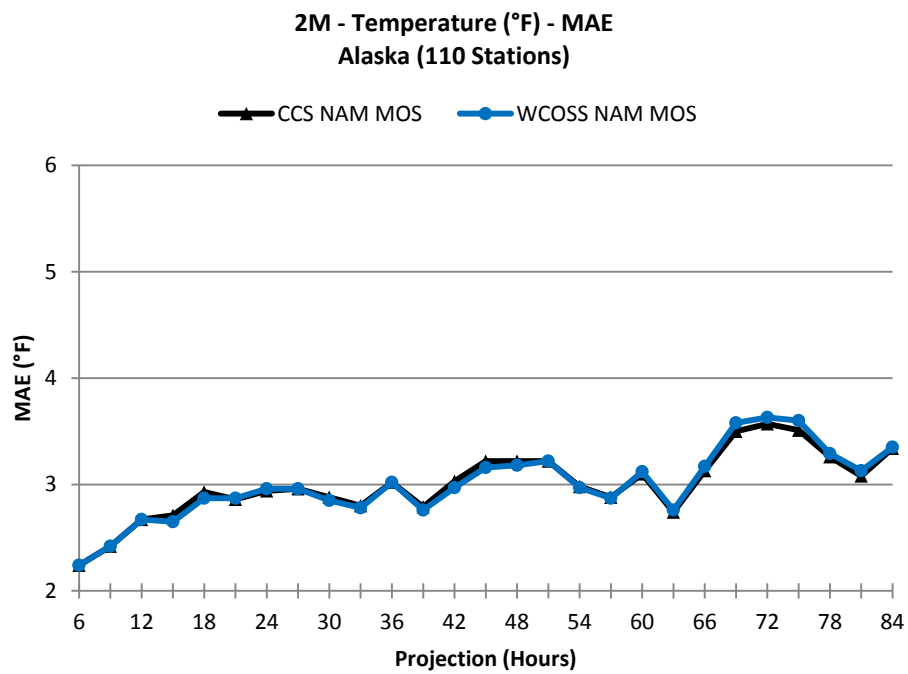
Metric:
MAE

Projection Hours:
6hr – 84hr (Every 3 hrs)

Station Sample:
CONUS + OCONUS – 1440 Stations
Alaska – 110 Stations







CCS NAM MOS vs. WCOSS NAM MOS

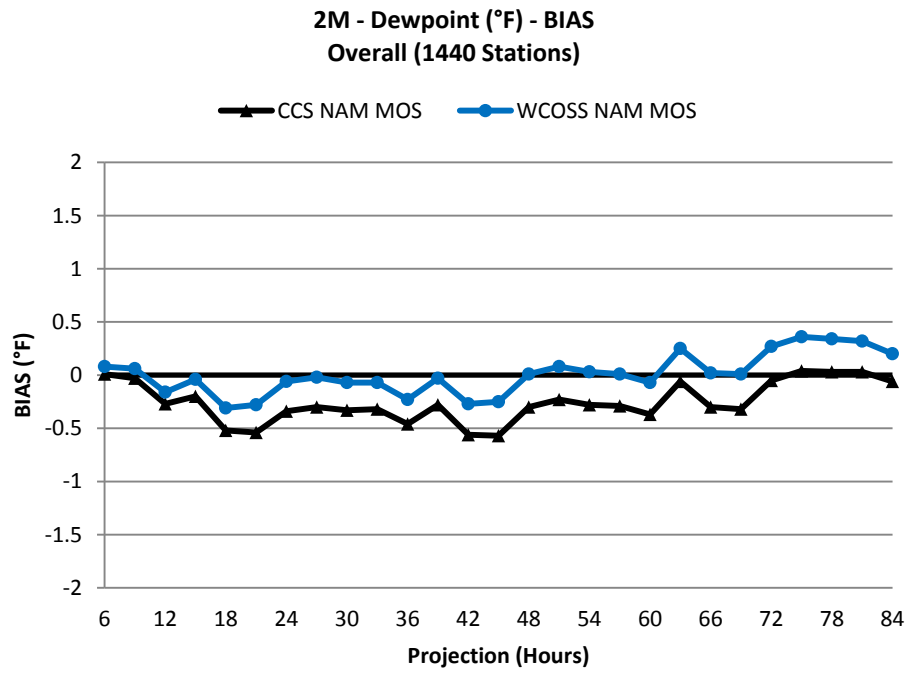
May 9, 2013 – May 31, 2013
0000 UTC Cycle

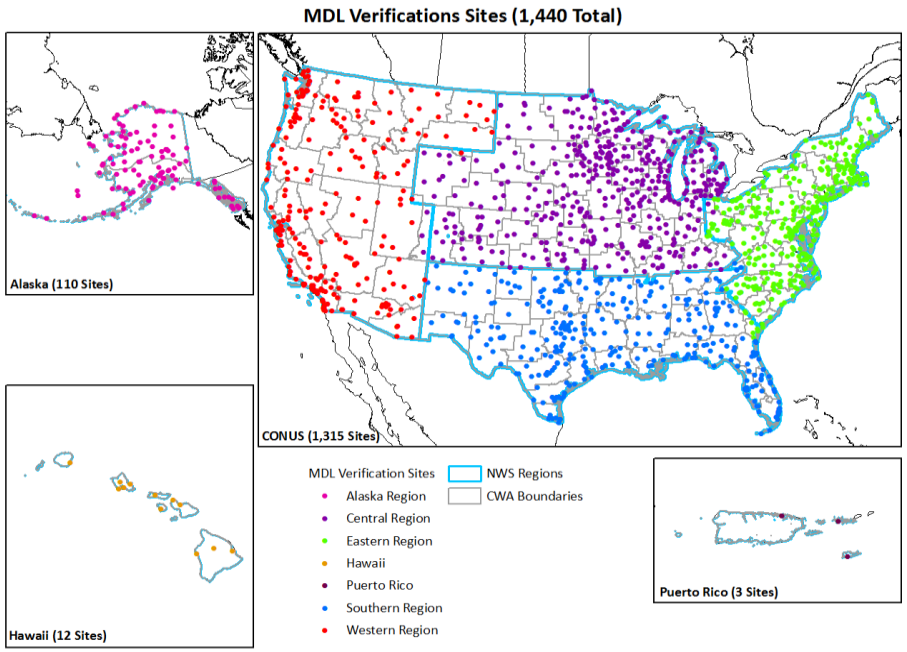
Weather Element:
2M - Dewpoint(°F)

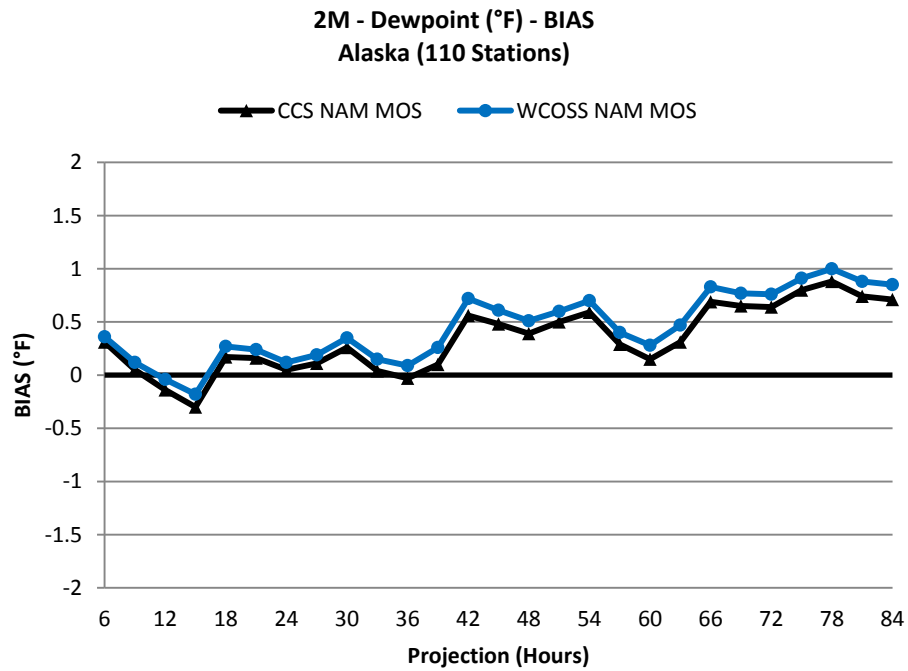
Metric:
BIAS

Projection Hours:
6hr – 84hr (Every 3 hrs)

Station Sample:
CONUS + OCONUS – 1440 Stations
Alaska – 110 Stations







CCS NAM MOS vs. WCOSS NAM MOS

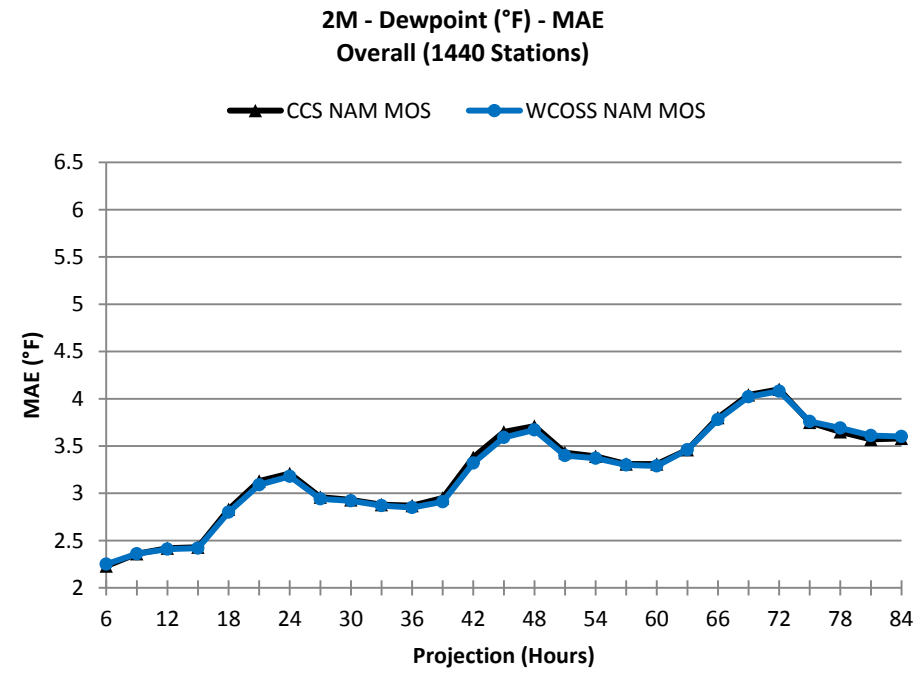
May 9, 2013 – May 31, 2013
0000 UTC Cycle

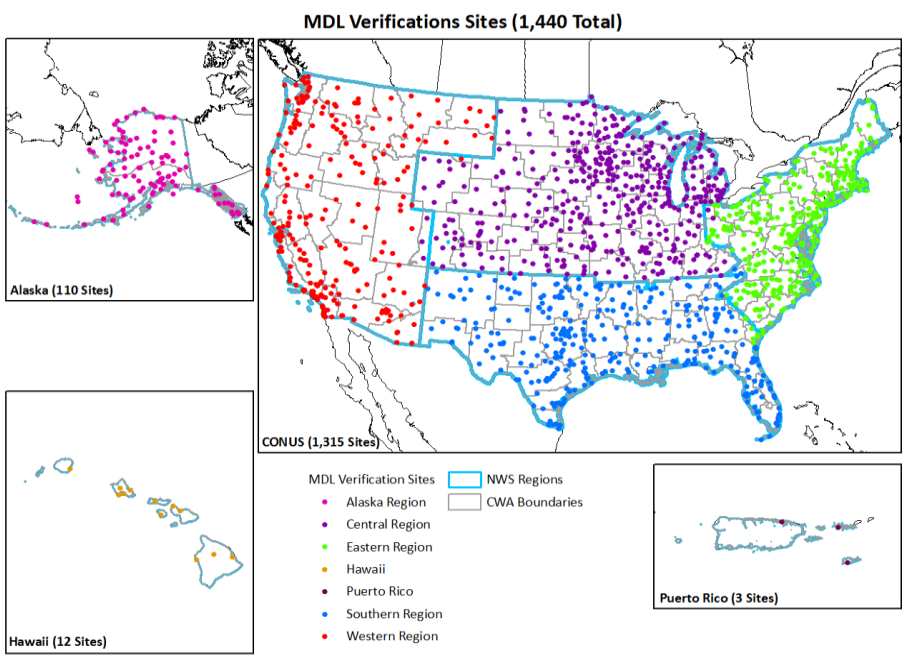
Weather Element:
2M - Dewpoint(°F)

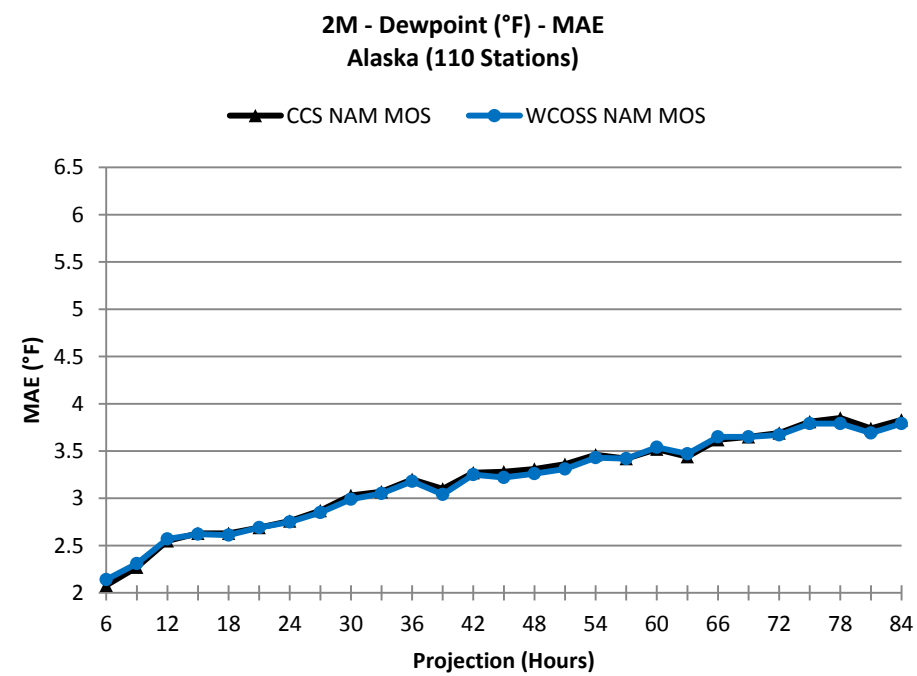
Metric:
MAE

Projection Hours:
6hr – 84hr (Every 3 hrs)

Station Sample:
CONUS + OCONUS – 1440 Stations
Alaska – 110 Stations







CCS NAM MOS vs. WCOSS NAM MOS

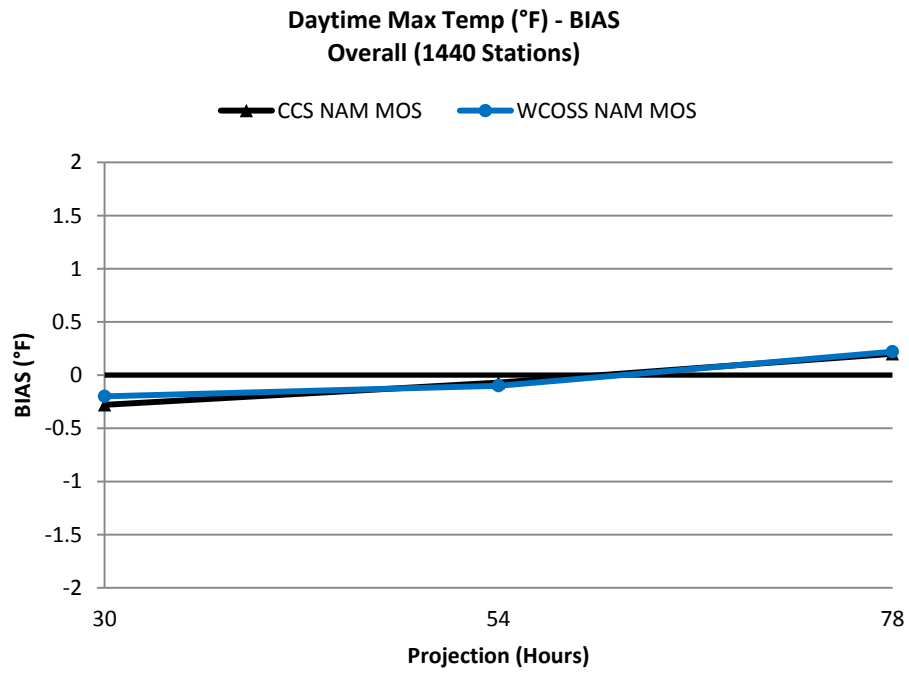
May 9, 2013 – May 31, 2013
0000 UTC Cycle

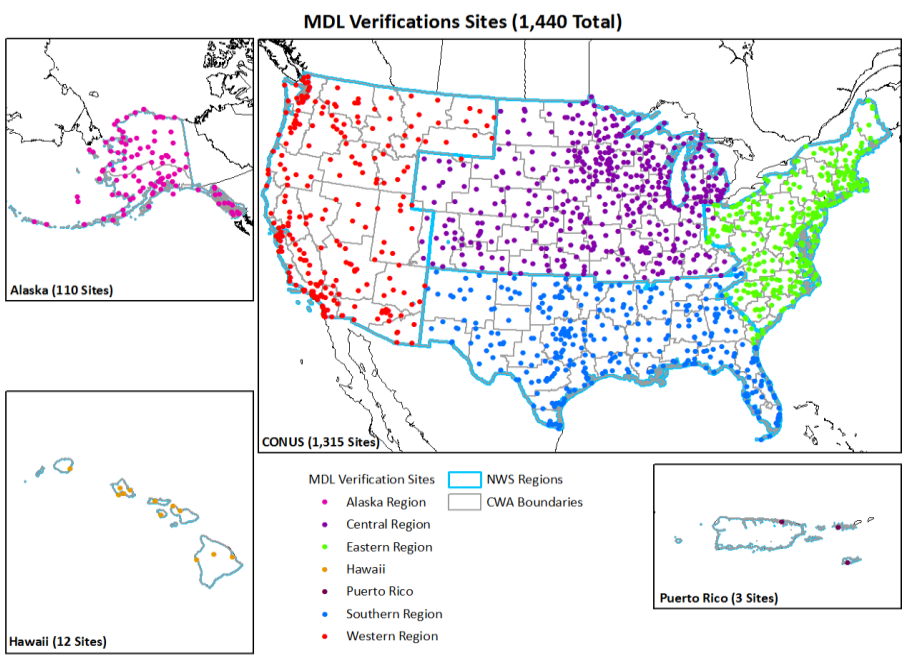
Weather Element:
Daytime Max Temperature (°F)

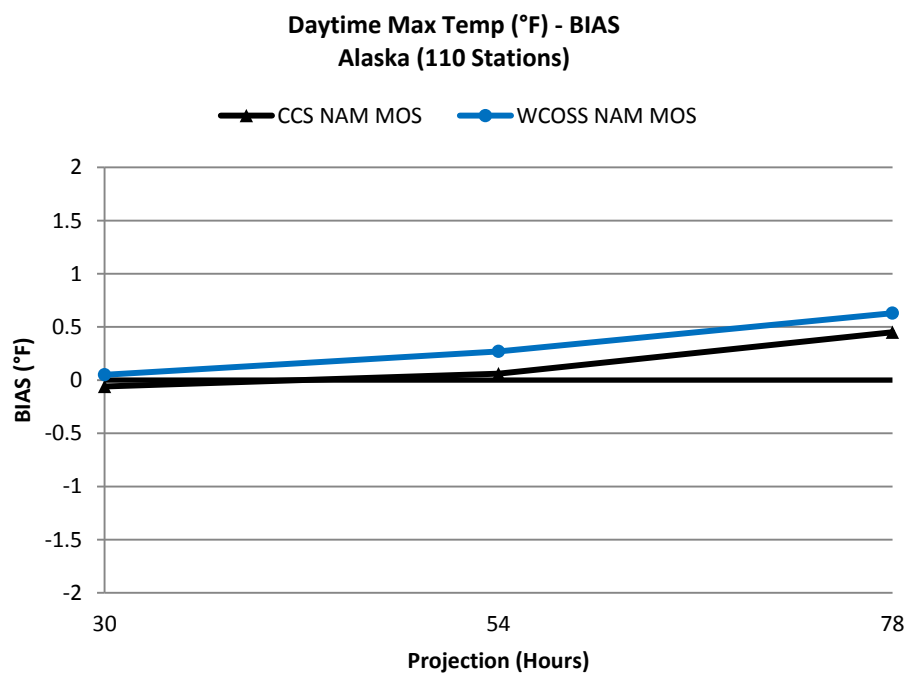
Metric:
BIAS

Projection Hours:
6hr – 84hr (Every 3 hrs)

Station Sample:
CONUS + OCONUS – 1440 Stations
Alaska – 110 Stations







CCS NAM MOS vs. WCOSS NAM MOS

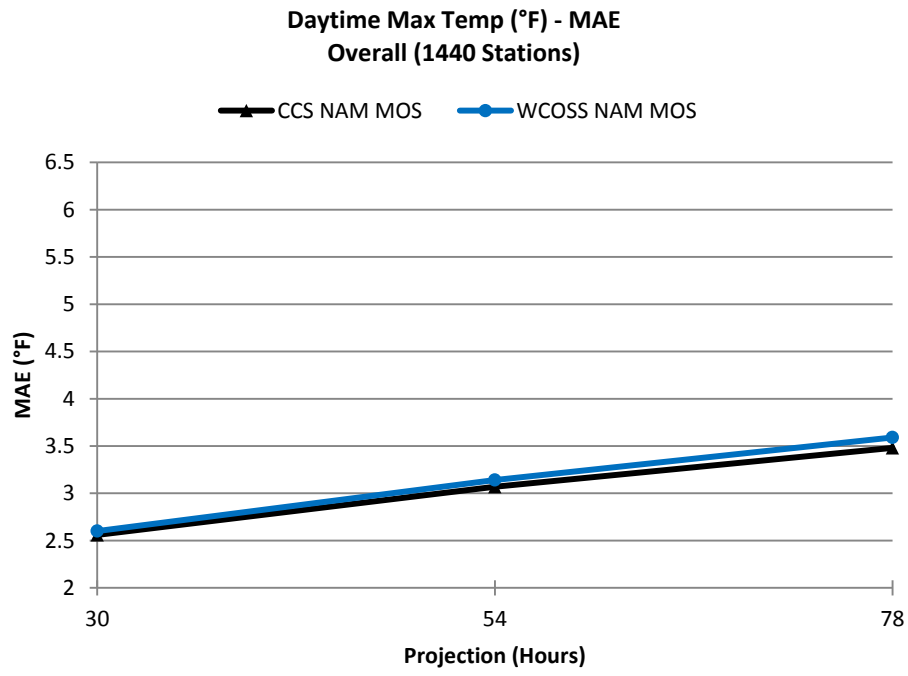
May 9, 2013 – May 31, 2013
0000 UTC Cycle

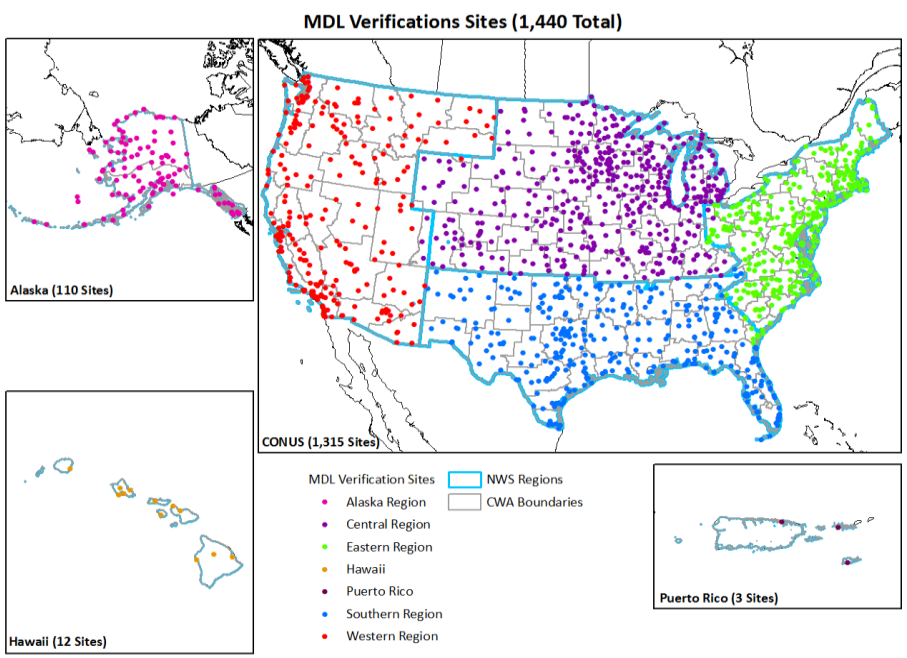
Weather Element:
Daytime Max Temperature (°F)

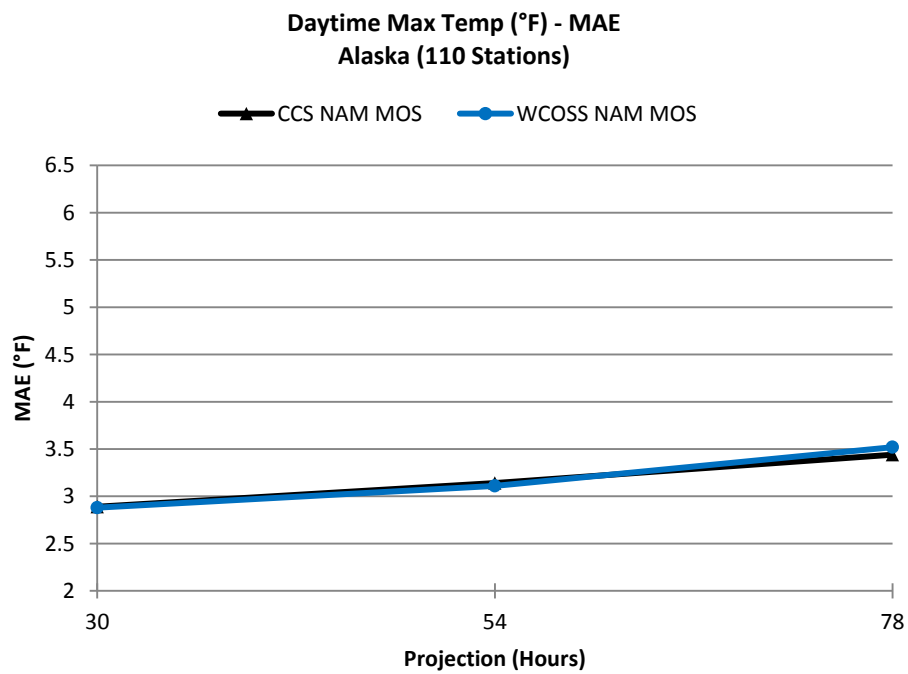
Metric:
MAE

Projection Hours:
6hr – 84hr (Every 3 hrs)

Station Sample:
CONUS + OCONUS – 1440 Stations
Alaska – 110 Stations







CCS NAM MOS vs. WCOSS NAM MOS

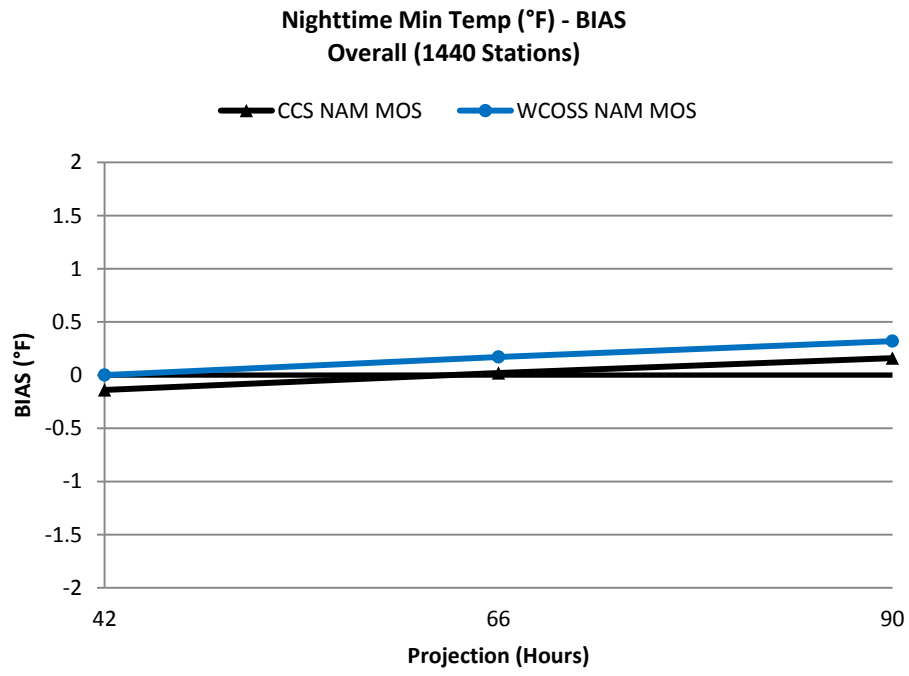
May 9, 2013 – May 31, 2013
0000 UTC Cycle

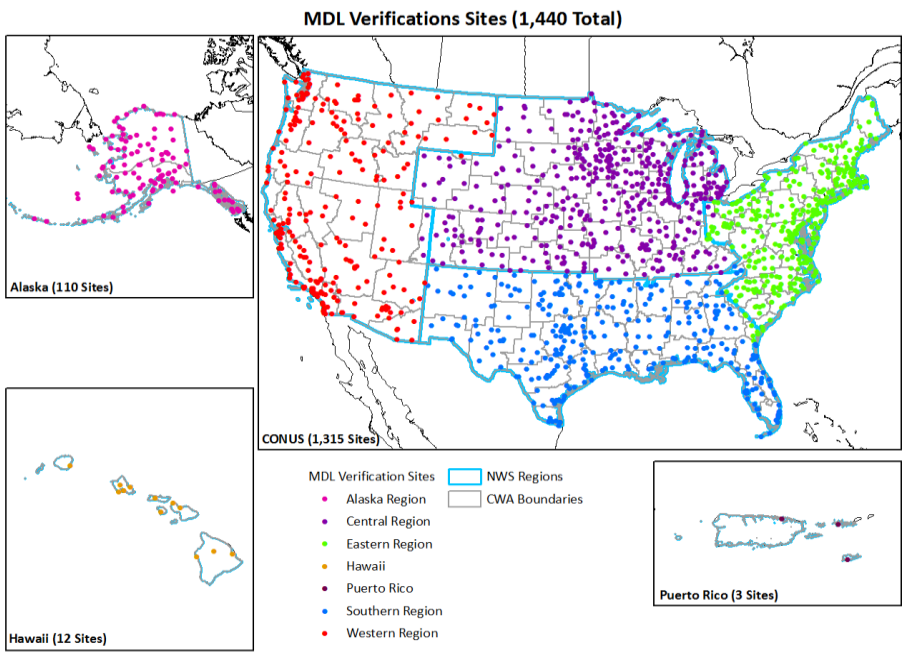
Weather Element:
Nighttime Min Temperature (°F)

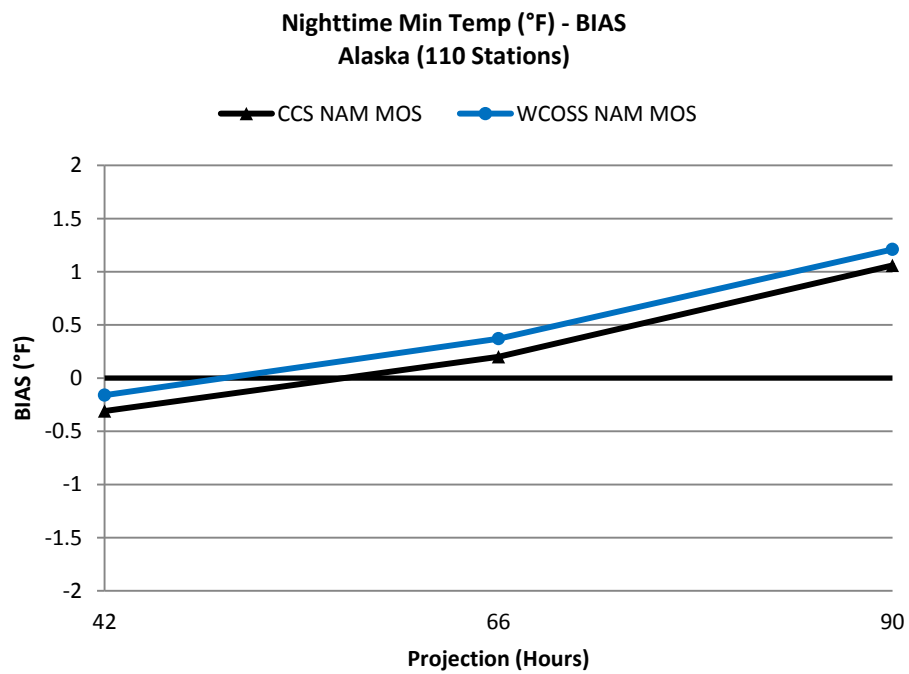
Metric:
BIAS

Projection Hours:
6hr – 84hr (Every 3 hrs)

Station Sample:
CONUS + OCONUS – 1440 Stations
Alaska – 110 Stations







CCS NAM MOS vs. WCOSS NAM MOS

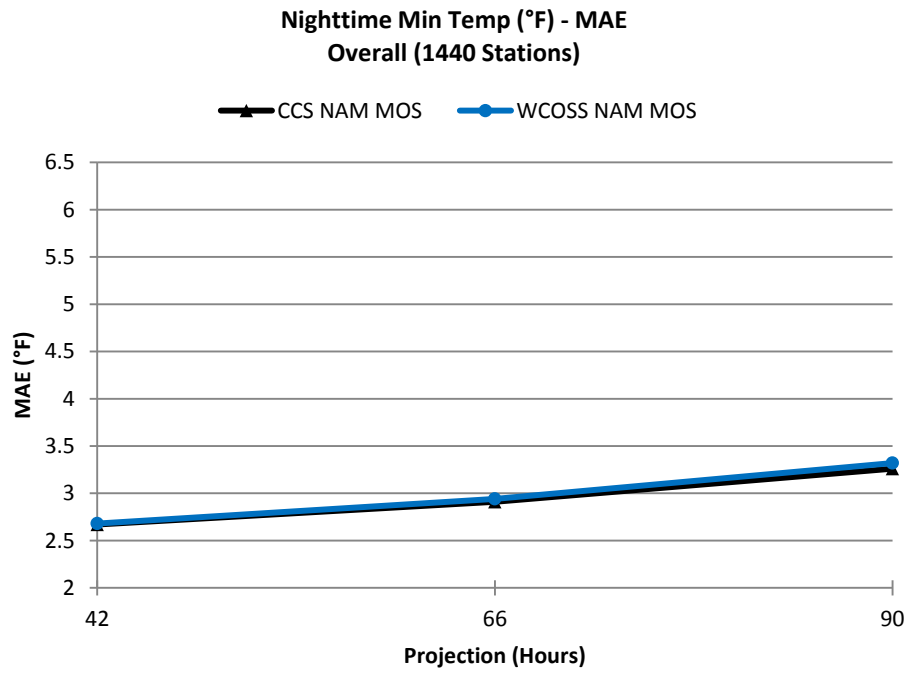
May 9, 2013 – May 31, 2013
0000 UTC Cycle

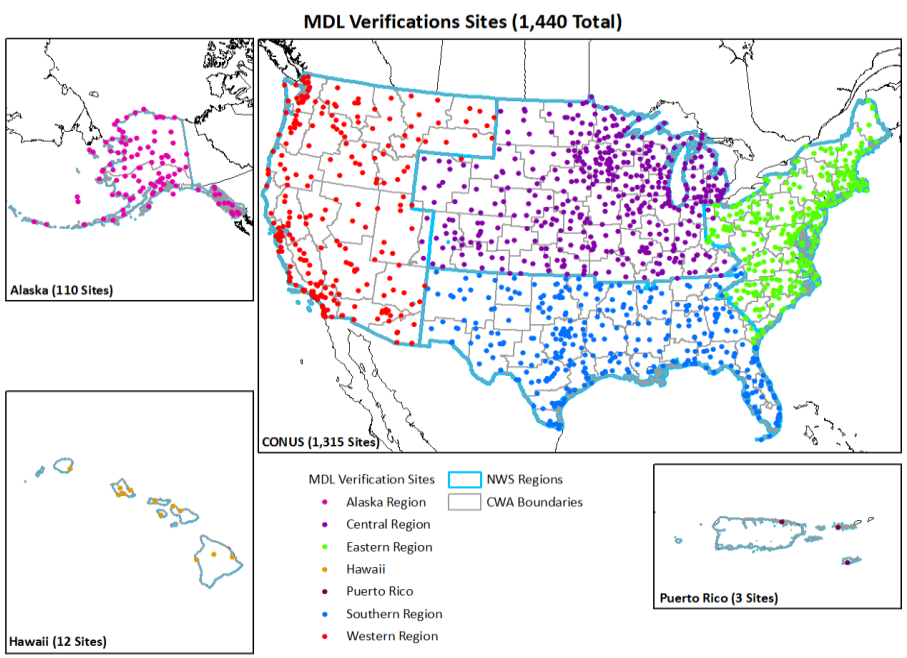
Weather Element:
Nighttime Min Temperature (°F)

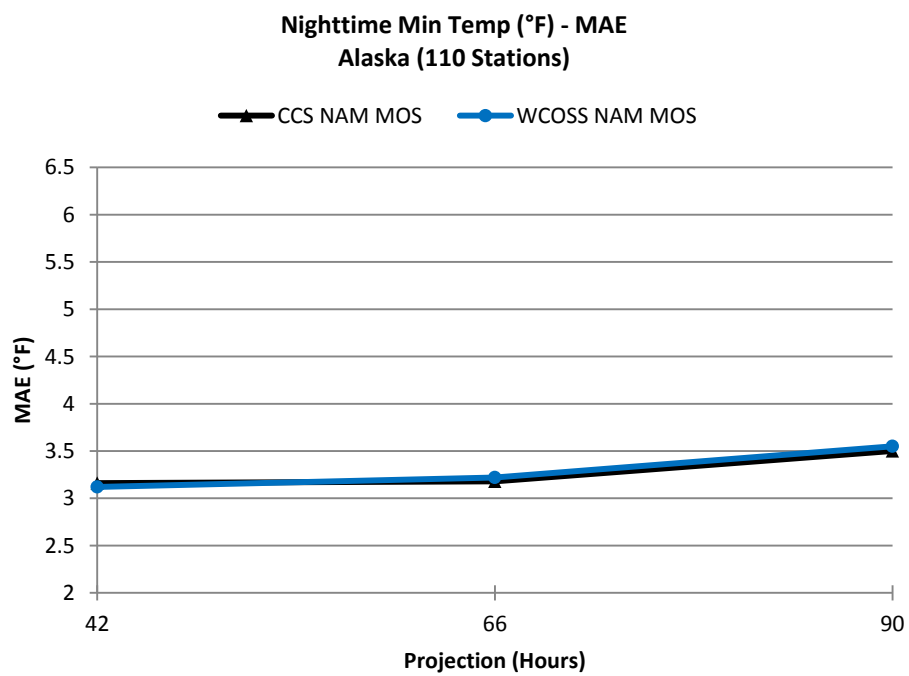
Metric:
MAE

Projection Hours:
6hr – 84hr (Every 3 hrs)

Station Sample:
CONUS + OCONUS – 1440 Stations
Alaska – 110 Stations







CCS NAM MOS vs. WCOSS NAM MOS

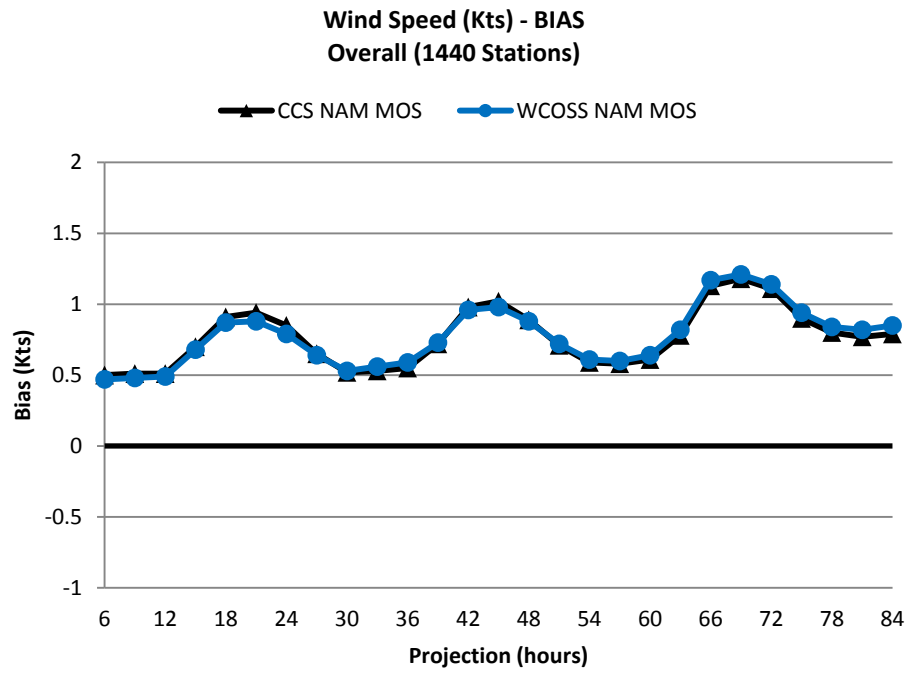
May 9, 2013 – May 31, 2013
0000 UTC Cycle

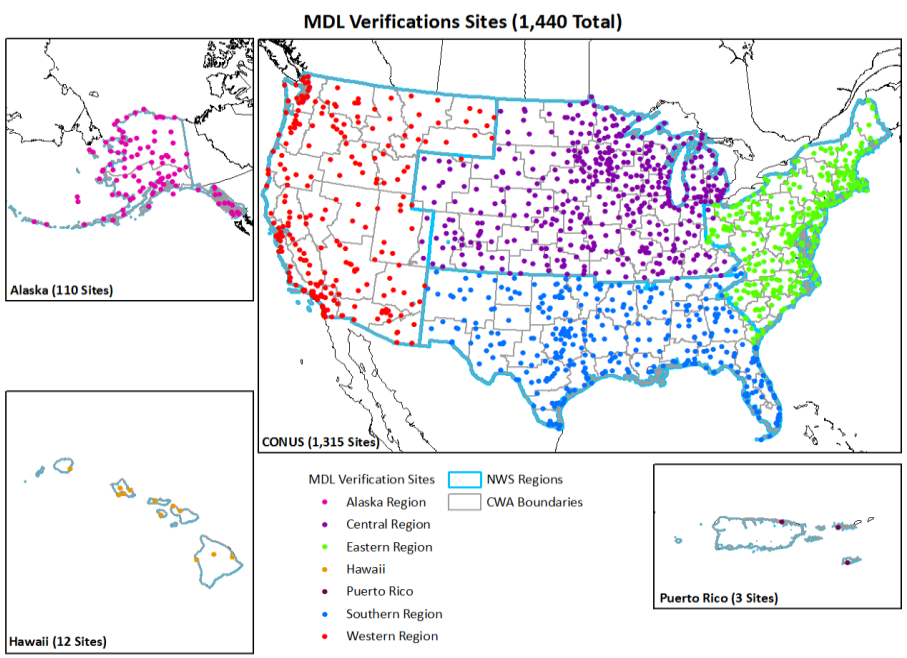
Weather Element:
Wind Speed (Kts)

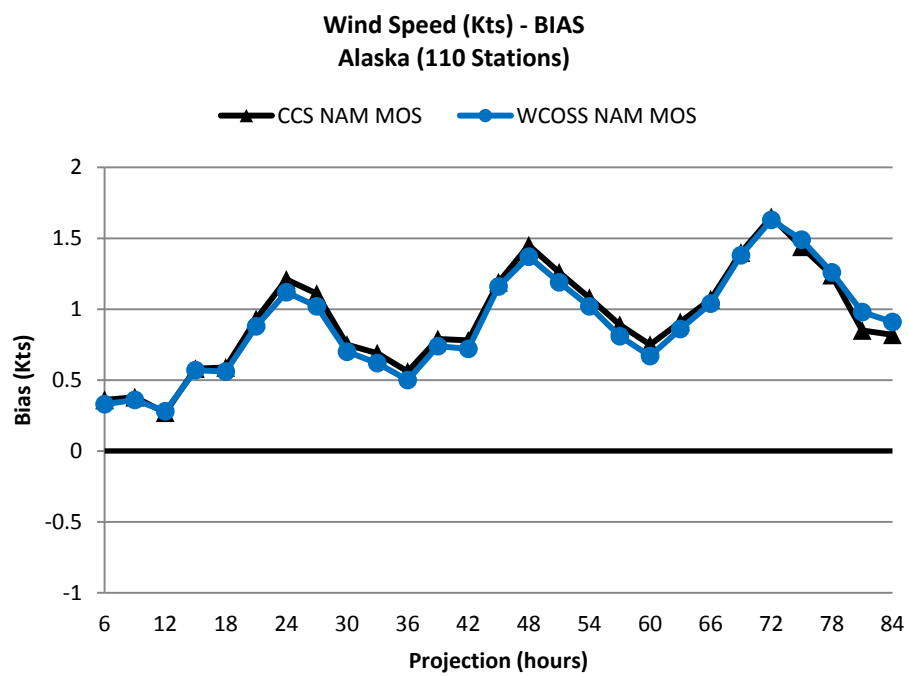
Metric:
BIAS

Projection Hours:
6hr – 84hr (Every 3 hrs)

Station Sample:
CONUS + OCONUS – 1440 Stations
Alaska – 110 Stations







CCS NAM MOS vs. WCOSS NAM MOS

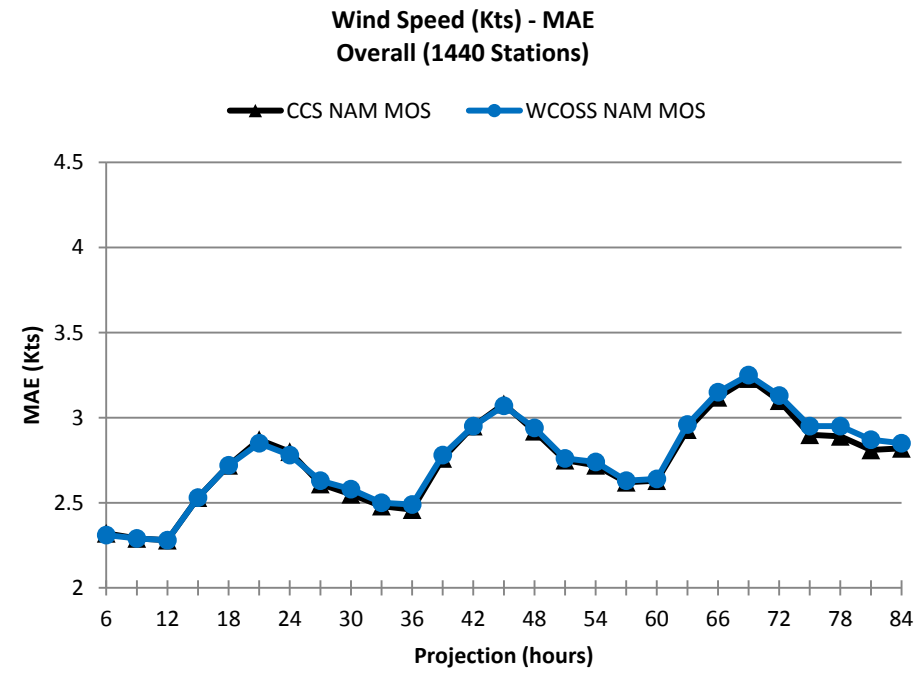
May 9, 2013 – May 31, 2013
0000 UTC Cycle

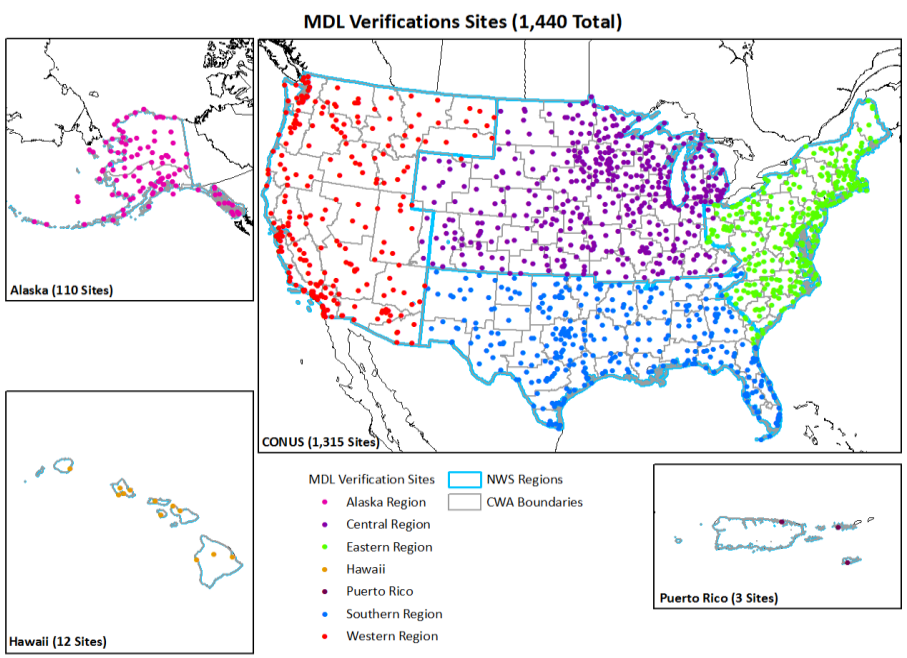
Weather Element:
Wind Speed (Kts)

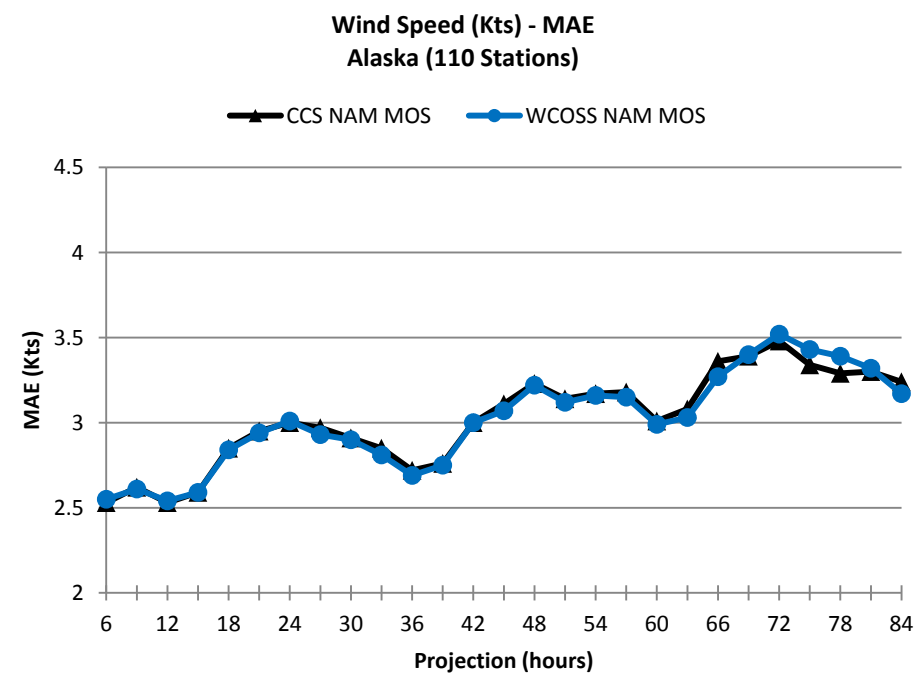
Metric:
MAE

Projection Hours:
6hr – 84hr (Every 3 hrs)

Station Sample:
CONUS + OCONUS – 1440 Stations
Alaska – 110 Stations







CCS NAM MOS vs. WCOSS NAM MOS

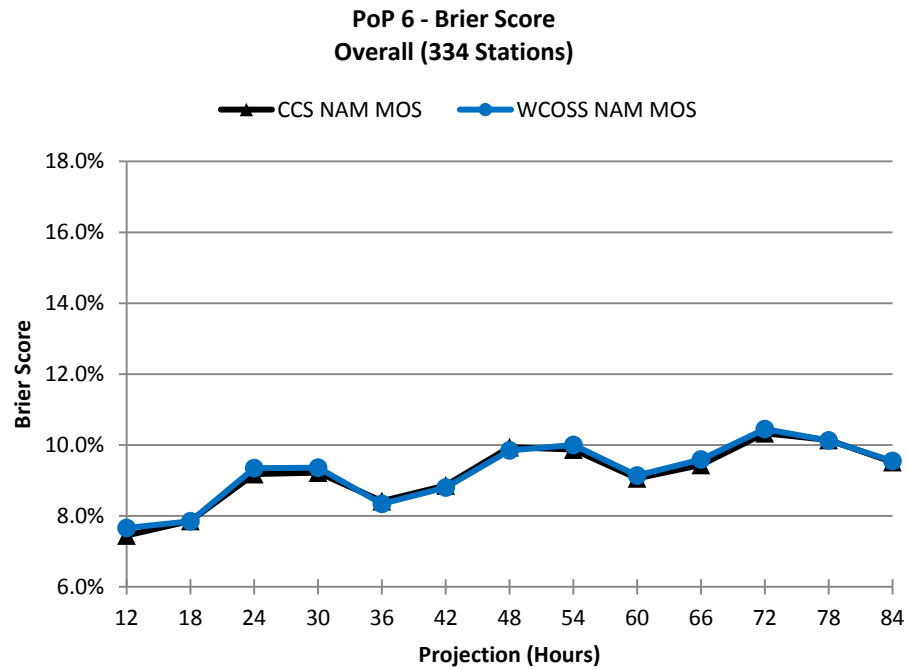
May 9, 2013 – May 31, 2013
0000 UTC Cycle

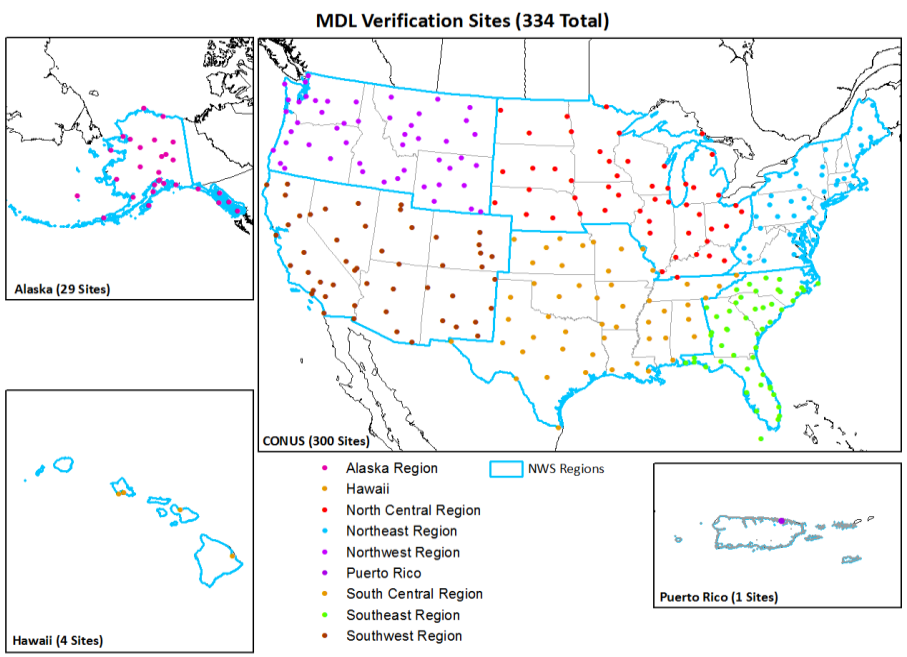
Weather Element:
PoP 6 & PoP 12

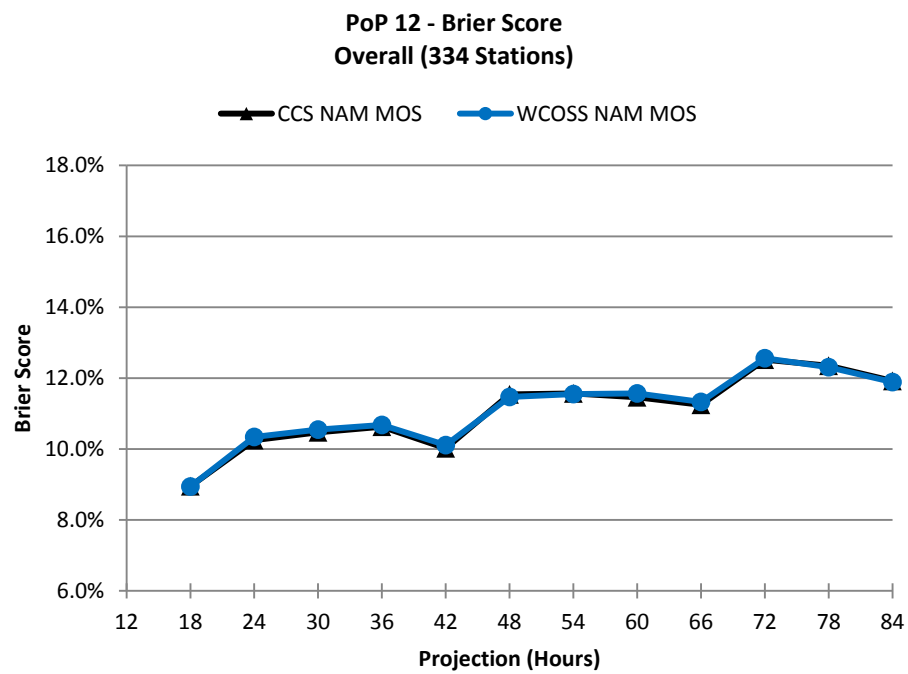
Metric:
Brier Score

Projection Hours:
6hr – 84hr (Every 6 hrs)

Station Sample:
CONUS + OCONUS – 334 Stations







Regional Verification of
CCS NAM MOS vs. WCOSS NAM MOS

May 9, 2013 – May 31, 2013 0000 UTC cycle

Station Sample:

Western - 239 Stations Central - 441 Stations

Southern - 331 Stations Eastern - 308 Stations

Office of Science and Technology, Meteorological Development Lab

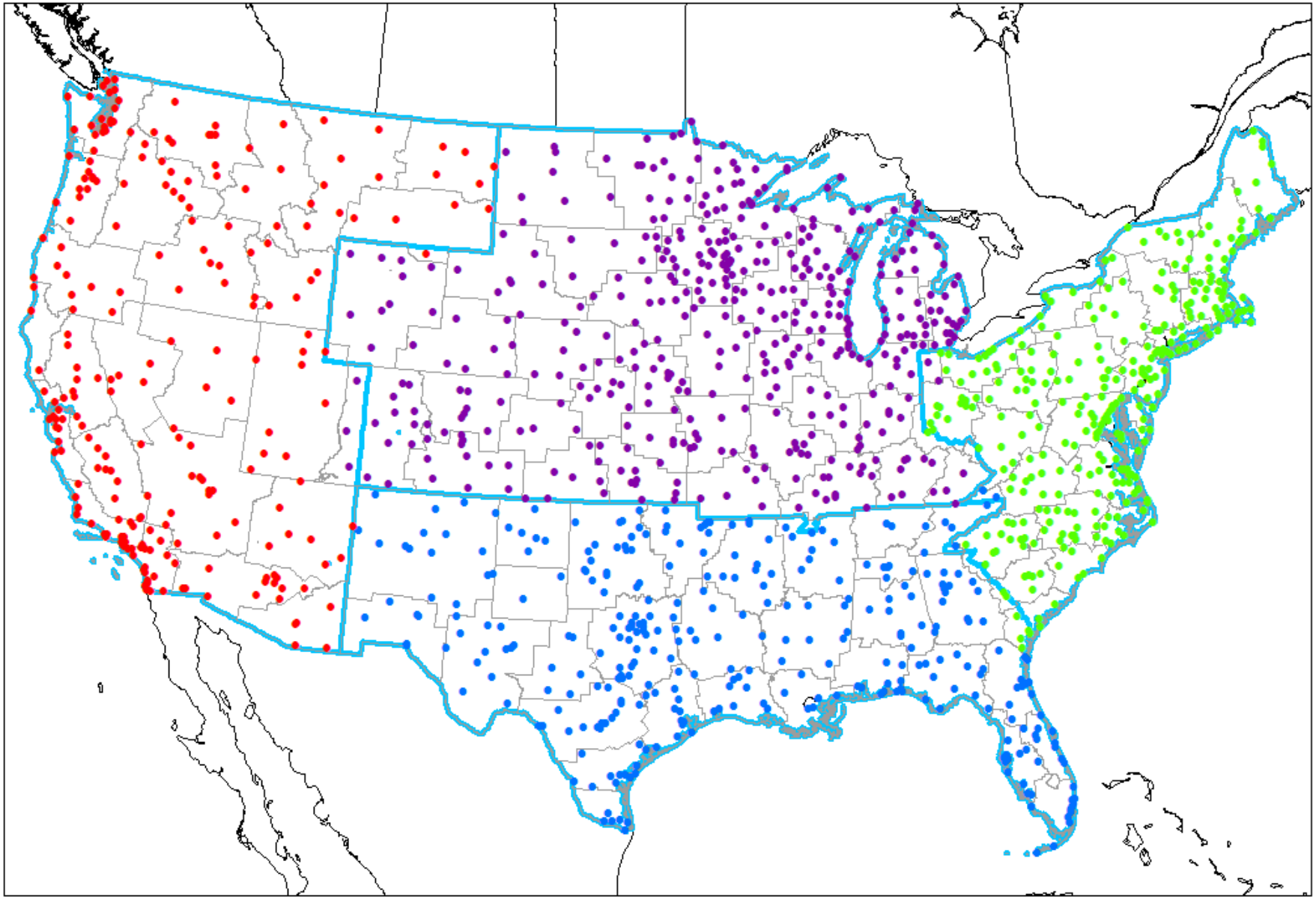
Evaluation completed: 6/12/13

Regional Verification of
CCS NAM MOS vs. WCOSS NAM MOS

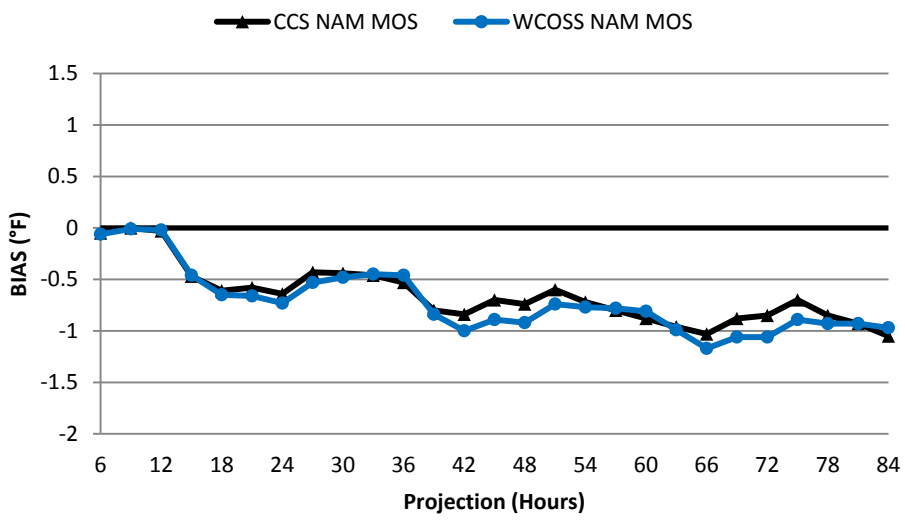
Overall NAM MOS evaluations indicated bias differences between the WCOSS and CCS versions. The scores were further stratified to help identify any possible regional geographic variations in MOS performance.

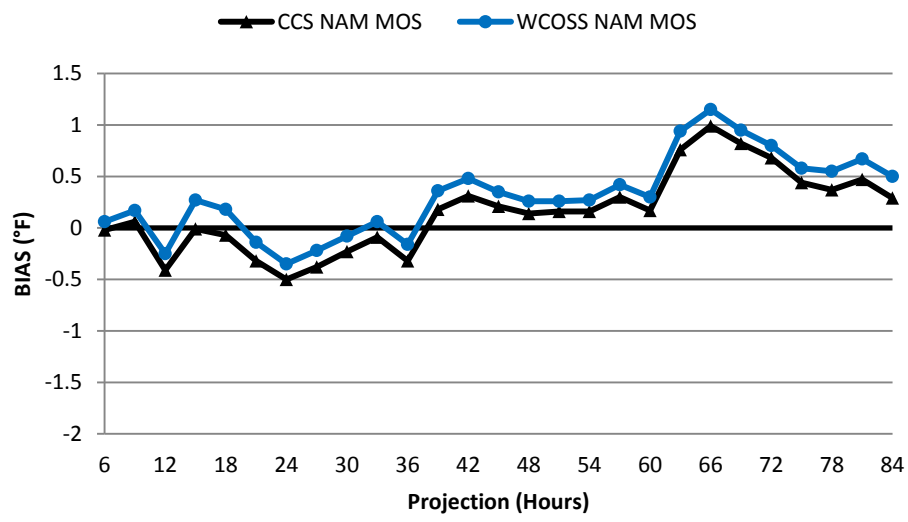
Weather Elements:	Metrics:	Projection Hours:
2M – Temperature (°F)	BIAS	6hr – 84hr
2M – Dewpoint (°F)	MAE	

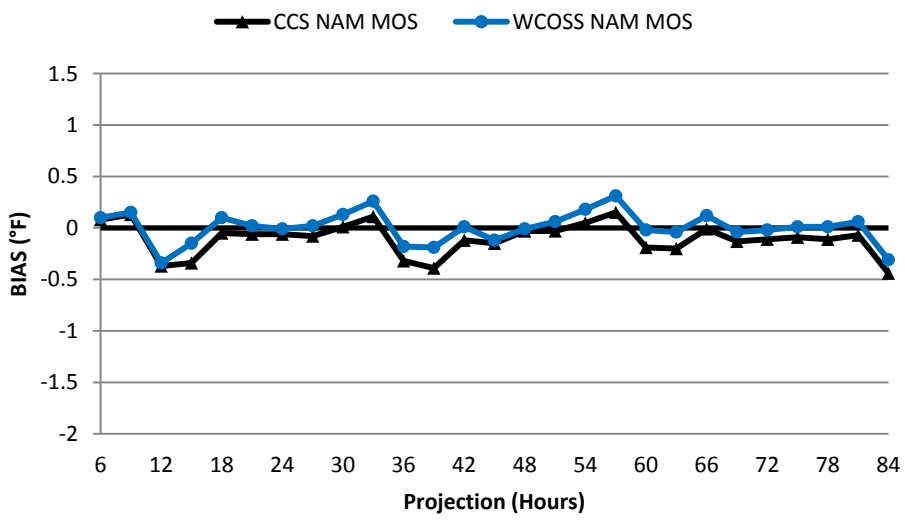
MDL Verification Sites for CONUS (1,319 Total)

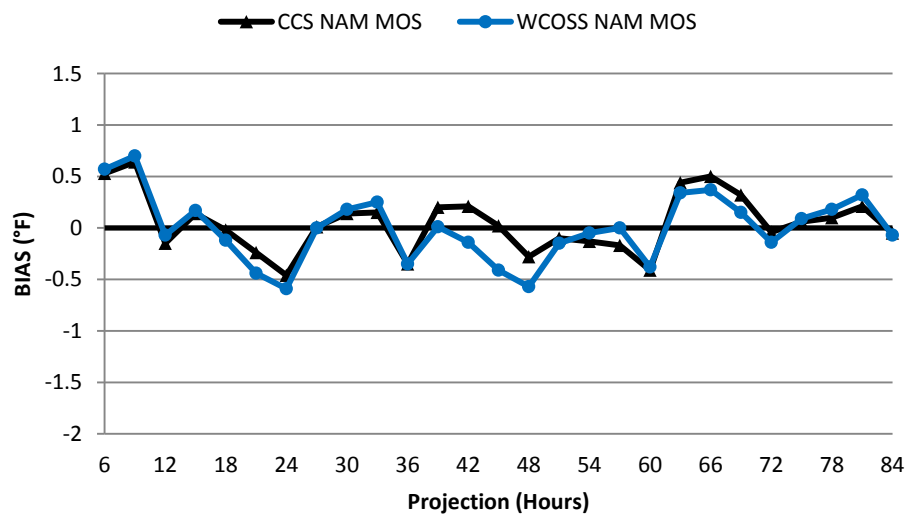


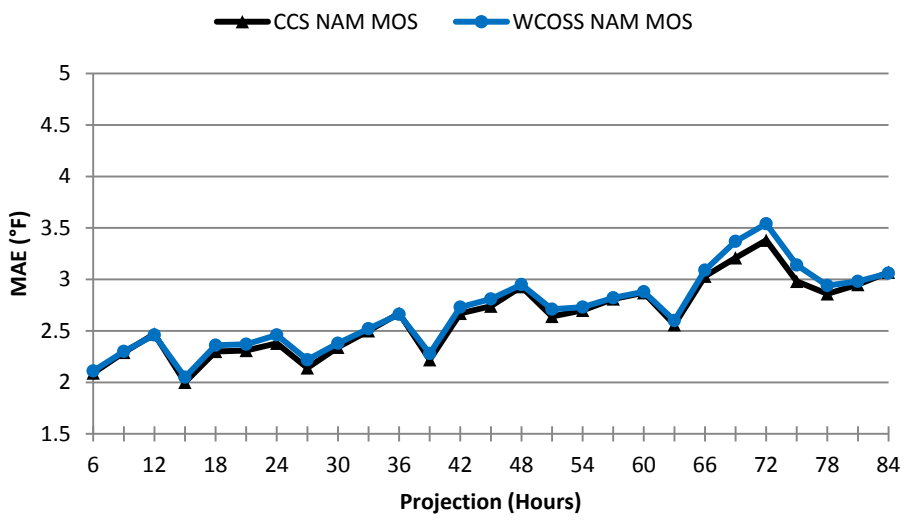
Central Region Sites · Eastern Region Sites · Southern Region Sites · Western Region Sites · CWA Boundaries · NWS Regions

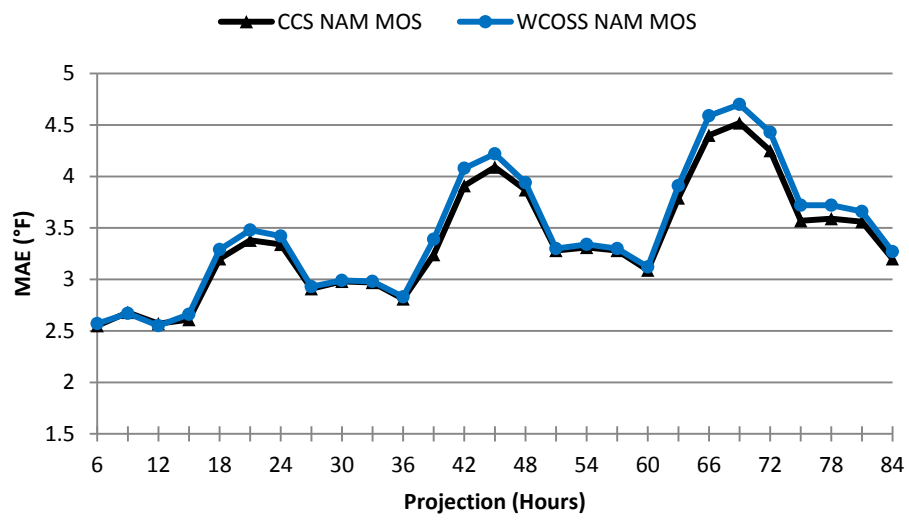

CCS vs. WCOSS
2M - Temperature (°F) - 0000 UTC NAM MOS - BIAS
May 9, 2013 - May 31, 2013
Western (239 Stations)
CCS NAM MOS
WCOSS NAM MOS
BIAS (°F)
1.5
1
0.5
0
-0.5
-1
-1.5
-2
6 12 18 24 30 36 42 48 54 60 66 72 78 84
Projection (Hours)

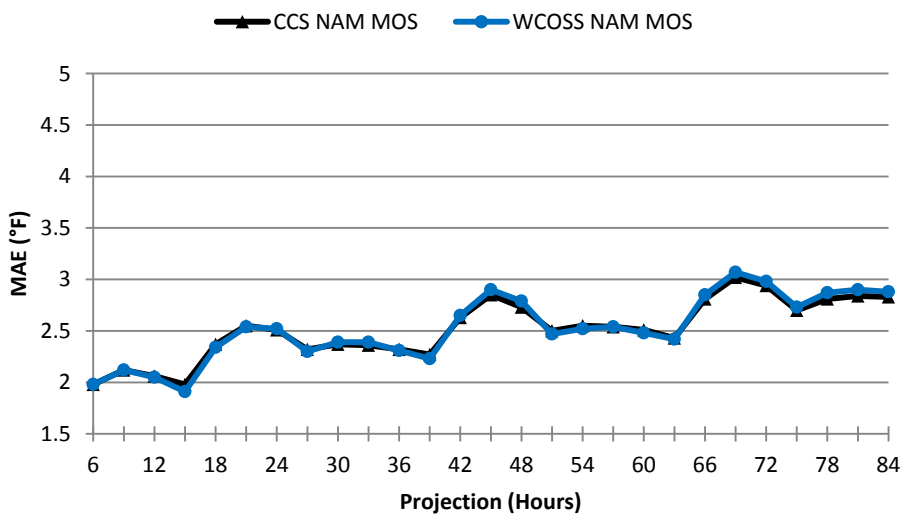

CCS vs. WCOSS
2M - Temperature (°F) - 0000 UTC NAM MOS - BIAS
May 9, 2013 - May 31, 2013
Central (441 Stations)
CCS NAM MOS
WCOSS NAM MOS
BIAS (°F)
1.5
1
0.5
0
-0.5
-1
-1.5
-2
6 12 18 24 30 36 42 48 54 60 66 72 78 84
Projection (Hours)

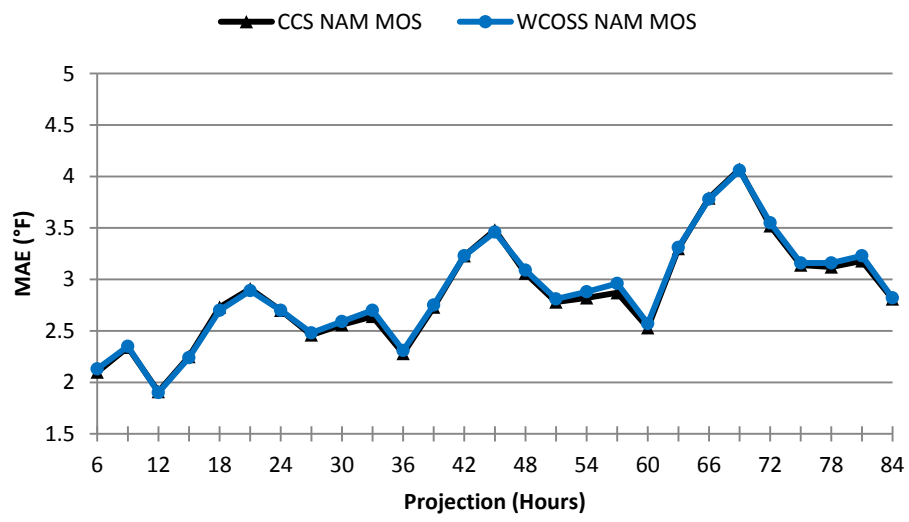

CCS vs. WCOSS
2M - Temperature (°F) - 0000 UTC NAM MOS - BIAS
May 9, 2013 - May 31, 2013
Southern (331 Stations)
CCS NAM MOS
WCOSS NAM MOS
BIAS (°F)
1.5
1
0.5
0
-0.5
-1
-1.5
-2
6 12 18 24 30 36 42 48 54 60 66 72 78 84
Projection (Hours)

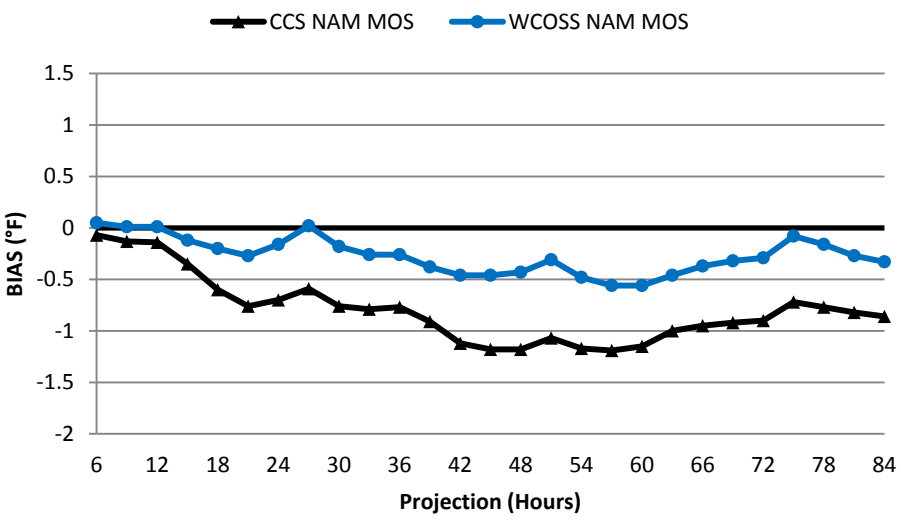

CCS vs. WCOSS
2M - Temperature (°F) - 0000 UTC NAM MOS - BIAS
May 9, 2013 - May 31, 2013
Eastern (308 Stations)
CCS NAM MOS
WCOSS NAM MOS
BIAS (°F)
1.5
1
0.5
0
-0.5
-1
-1.5
-2
6 12 18 24 30 36 42 48 54 60 66 72 78 84
Projection (Hours)

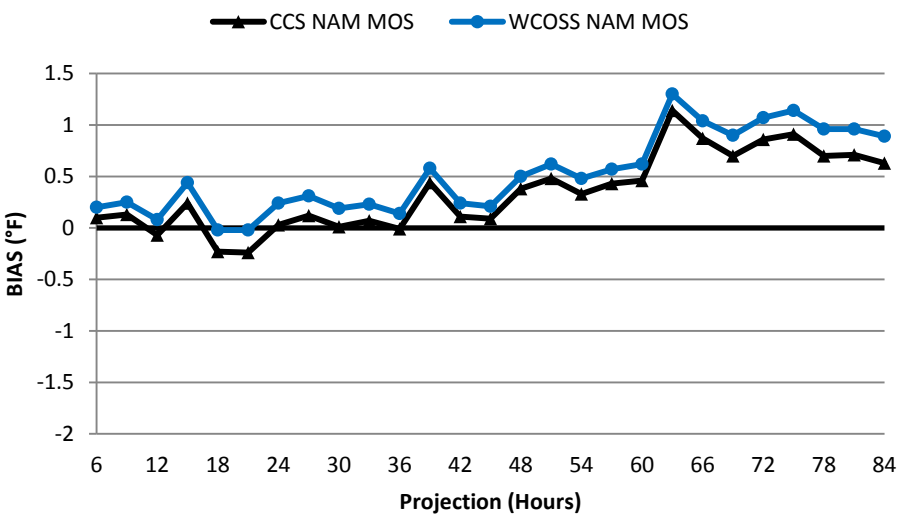

CCS vs. WCOSS
2M - Temperature (°F) - 0000 UTC NAM MOS - MAE
May 9, 2013 - May 31, 2013
Western (239 Stations)
CCS NAM MOS
WCOSS NAM MOS
MAE (°F)
5
4.5
4
3.5
3
2.5
2
1.5
6 12 18 24 30 36 42 48 54 60 66 72 78 84
Projection (Hours)

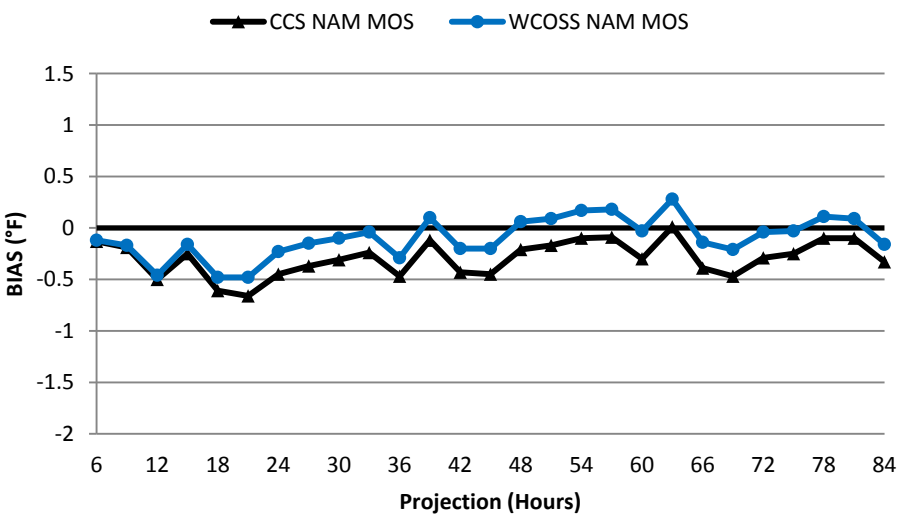

CCS vs. WCOSS
2M - Temperature (°F) - 0000 UTC NAM MOS - MAE
May 9, 2013 - May 31, 2013
Central (441 Stations)
CCS NAM MOS
WCOSS NAM MOS
MAE (°F)
5
4.5
4
3.5
3
2.5
2
1.5
6 12 18 24 30 36 42 48 54 60 66 72 78 84
Projection (Hours)

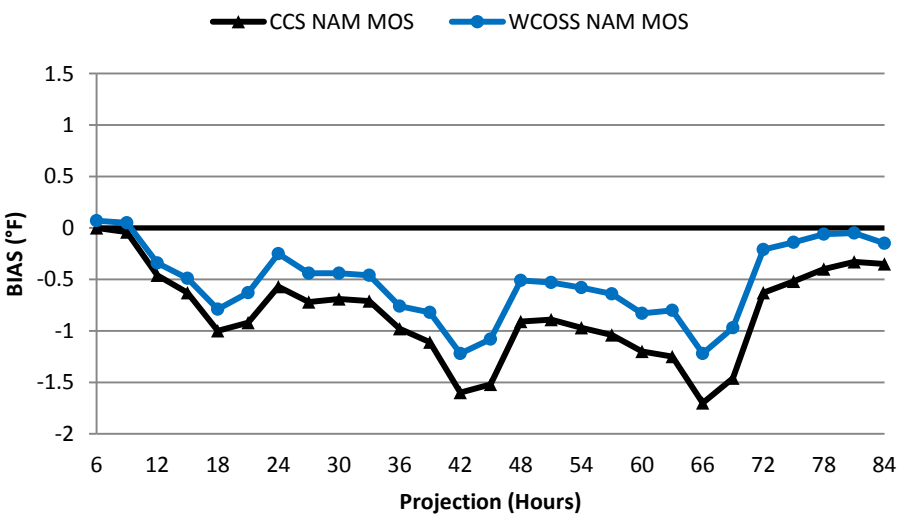

CCS vs. WCOSS
2M - Temperature (°F) - 0000 UTC NAM MOS - MAE
May 9, 2013 - May 31, 2013
Southern (331 Stations)
CCS NAM MOS
WCOSS NAM MOS
MAE (°F)
5
4.5
4
3.5
3
2.5
2
1.5
6 12 18 24 30 36 42 48 54 60 66 72 78 84
Projection (Hours)

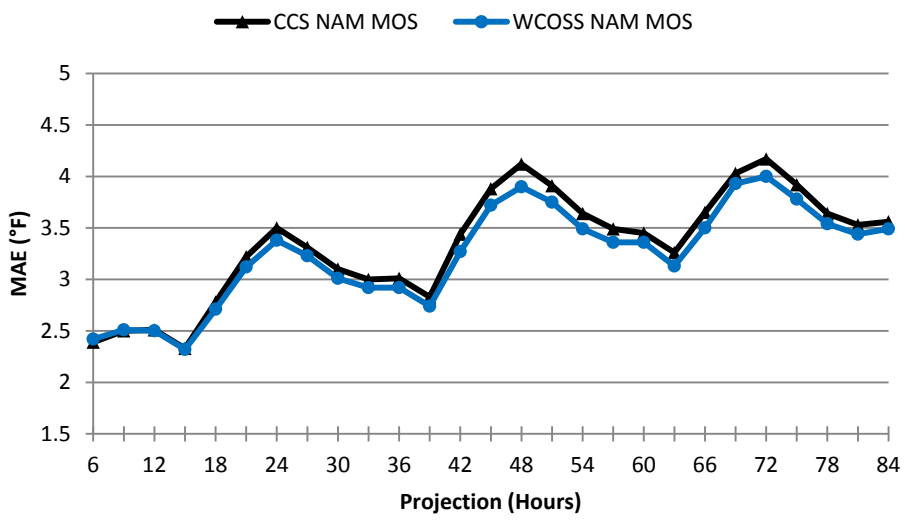

CCS vs. WCOSS
2M - Temperature (°F) - 0000 UTC NAM MOS - MAE
May 9, 2013 - May 31, 2013
Eastern (308 Stations)
CCS NAM MOS
WCOSS NAM MOS
MAE (°F)
5
4.5
4
3.5
3
2.5
2
1.5
6 12 18 24 30 36 42 48 54 60 66 72 78 84
Projection (Hours)

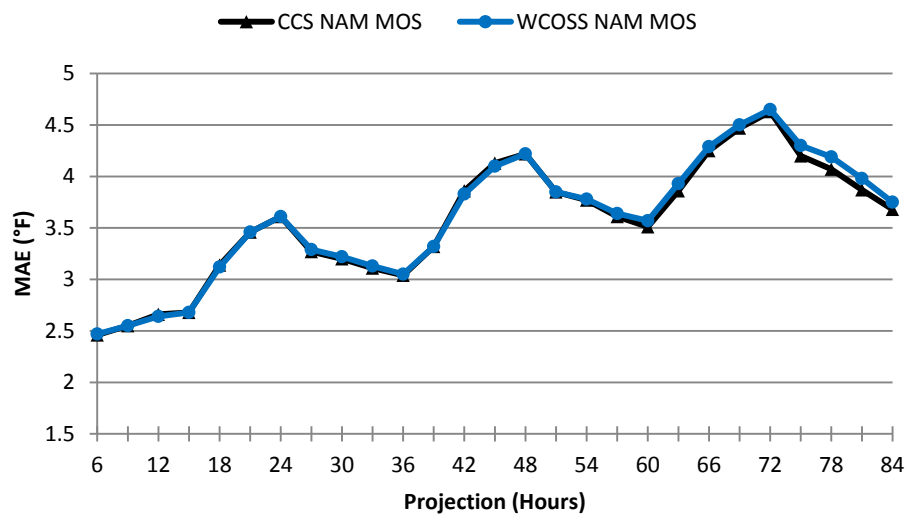

CCS vs. WCOSS
2M - Dewpoint (°F) - 0000 UTC NAM MOS - BIAS
May 9, 2013 - May 31, 2013
Western (239 Stations)
CCS NAM MOS
WCOSS NAM MOS
BIAS (°F)
1.5
1
0.5
0
-0.5
-1
-1.5
-2
6 12 18 24 30 36 42 48 54 60 66 72 78 84
Projection (Hours)

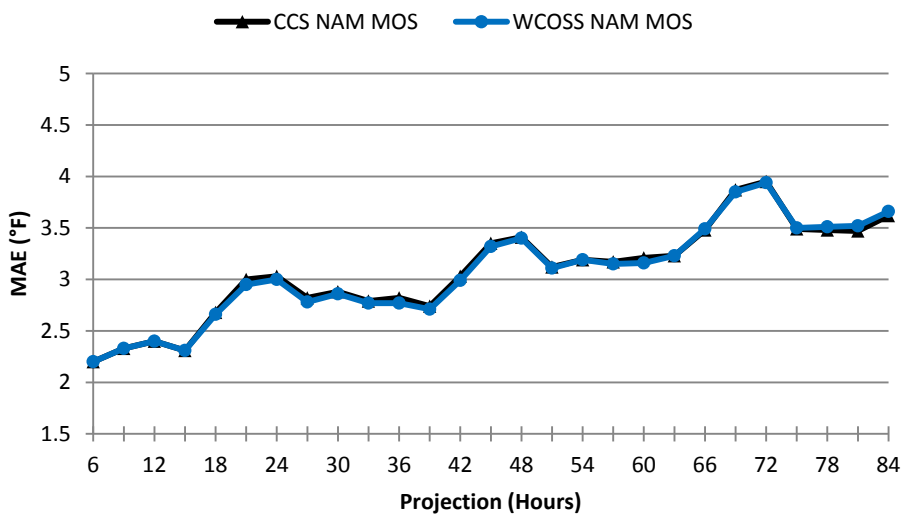

CCS vs. WCOSS
2M - Dewpoint (°F) - 0000 UTC NAM MOS - BIAS
May 9, 2013 - May 31, 2013
Central (441 Stations)
CCS NAM MOS
WCOSS NAM MOS
BIAS (°F)
1.5
1
0.5
0
-0.5
-1
-1.5
-2
6 12 18 24 30 36 42 48 54 60 66 72 78 84
Projection (Hours)

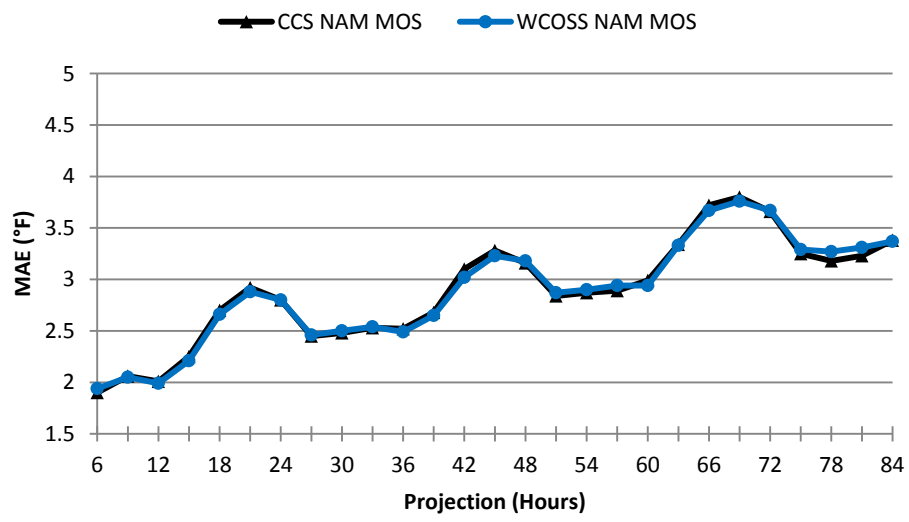

CCS vs. WCOSS
2M - Dewpoint (°F) - 0000 UTC NAM MOS - BIAS
May 9, 2013 - May 31, 2013
Southern (331 Stations)
CCS NAM MOS
WCOSS NAM MOS
BIAS (°F)
1.5
1
0.5
0
-0.5
-1
-1.5
-2
6 12 18 24 30 36 42 48 54 60 66 72 78 84
Projection (Hours)


CCS vs. WCOSS
2M - Dewpoint (°F) - 0000 UTC NAM MOS - BIAS
May 9, 2013 - May 31, 2013
Eastern (308 Stations)
CCS NAM MOS
WCOSS NAM MOS
BIAS (°F)
1.5
1
0.5
0
-0.5
-1
-1.5
-2
6 12 18 24 30 36 42 48 54 60 66 72 78 84
Projection (Hours)


CCS vs. WCOSS
2M - Dewpoint (°F) - 0000 UTC NAM MOS - MAE
May 9, 2013 - May 31, 2013
Western (239 Stations)
CCS NAM MOS
WCOSS NAM MOS
MAE (°F)
5
4.5
4
3.5
3
2.5
2
1.5
6 12 18 24 30 36 42 48 54 60 66 72 78 84
Projection (Hours)


CCS vs. WCOSS
2M - Dewpoint (°F) - 0000 UTC NAM MOS - MAE
May 9, 2013 - May 31, 2013
Central (441 Stations)
CCS NAM MOS
WCOSS NAM MOS
MAE (°F)
5
4.5
4
3.5
3
2.5
2
1.5
6 12 18 24 30 36 42 48 54 60 66 72 78 84
Projection (Hours)


CCS vs. WCOSS
2M - Dewpoint (°F) - 0000 UTC NAM MOS - MAE
May 9, 2013 - May 31, 2013
Southern (331 Stations)
CCS NAM MOS
WCOSS NAM MOS
MAE (°F)
5
4.5
4
3.5
3
2.5
2
1.5
6 12 18 24 30 36 42 48 54 60 66 72 78 84
Projection (Hours)


CCS vs. WCOSS
2M - Dewpoint (°F) - 0000 UTC NAM MOS - MAE
May 9, 2013 - May 31, 2013
Eastern (308 Stations)
CCS NAM MOS
WCOSS NAM MOS
MAE (°F)
5
4.5
4
3.5
3
2.5
2
1.5
6 12 18 24 30 36 42 48 54 60 66 72 78 84
Projection (Hours)

Verification of
CCS GFS MOS vs. WCOSS GFS MOS

May 9, 2013 – May 31, 2013 0000 UTC cycle

<u>Station Sample</u>:
Western Pacific – 15 Stations

Office of Science and Technology, Meteorological Development Lab
Evaluation completed: 7/22/13

CCS GFS MOS vs. WCOSS GFS MOS

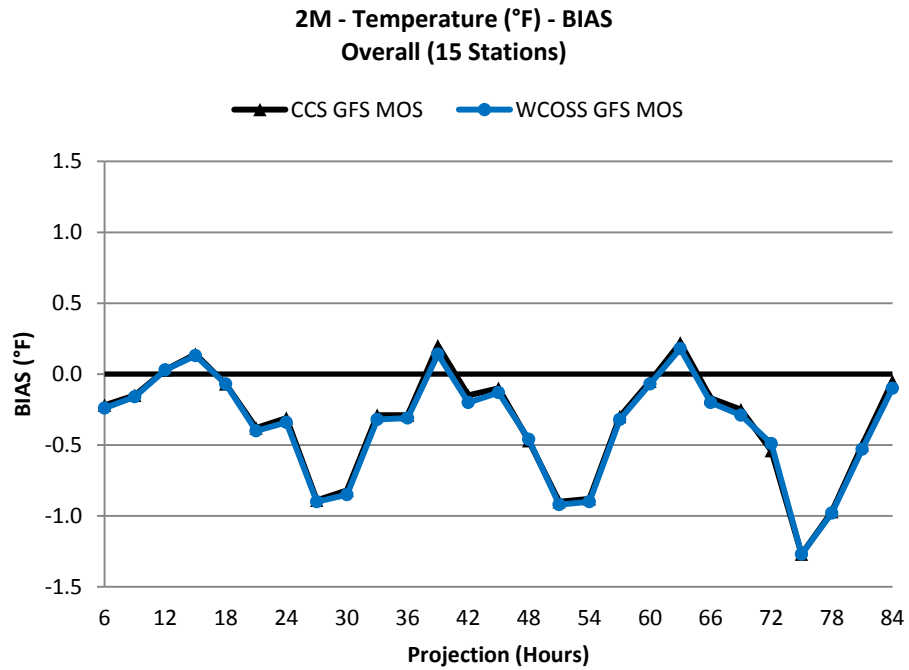
May 9, 2013 – May 31, 2013
0000 UTC Cycle

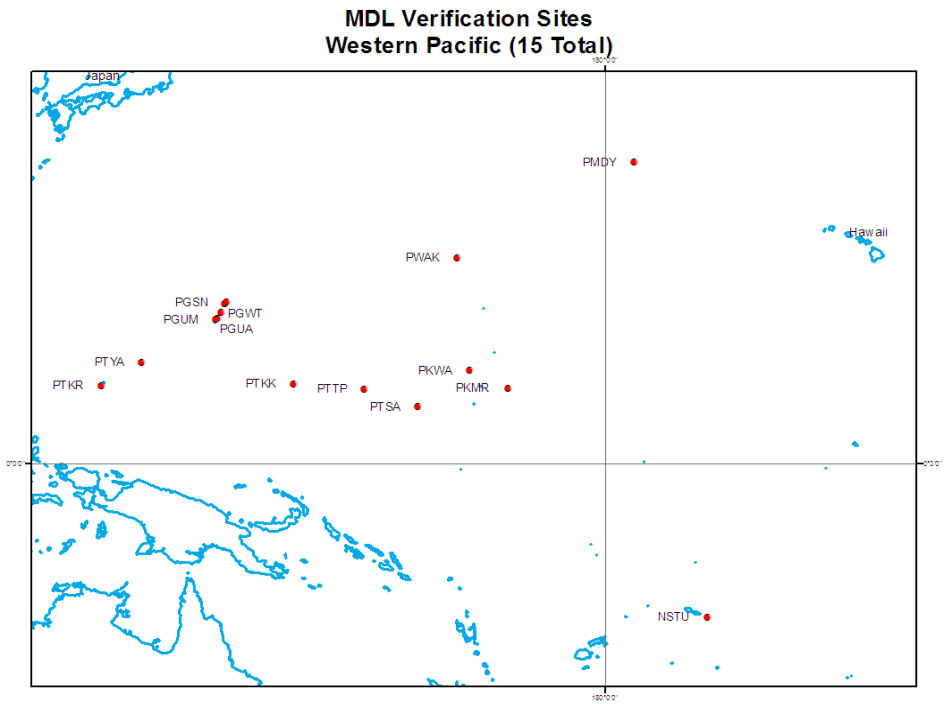
Weather Element:
Temperature & Dewpoint

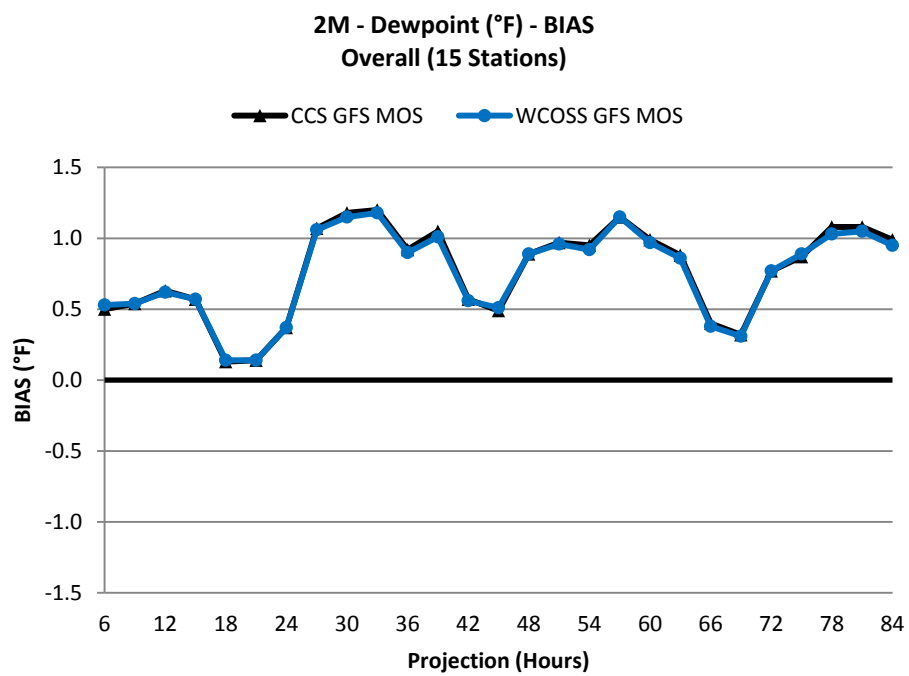
Metric:
BIAS

Projection Hours:
6hr – 84hr

Station Sample:
Western Pacific – 15 Stations







CCS GFS MOS vs. WCOSS GFS MOS

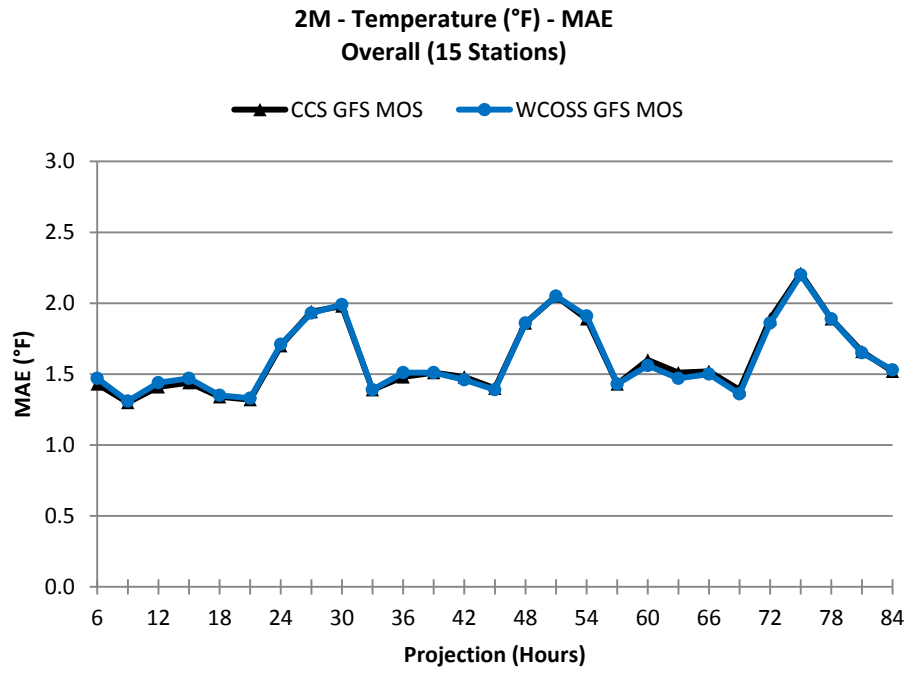
May 9, 2013 – May 31, 2013
0000 UTC Cycle

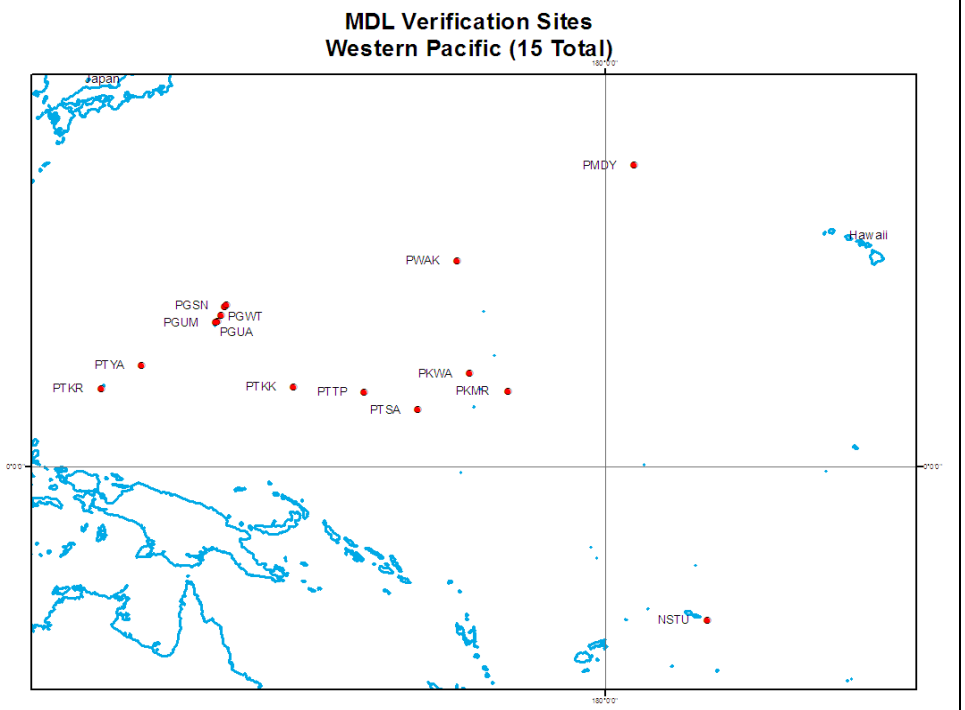
Weather Element:
Temperature & Dewpoint

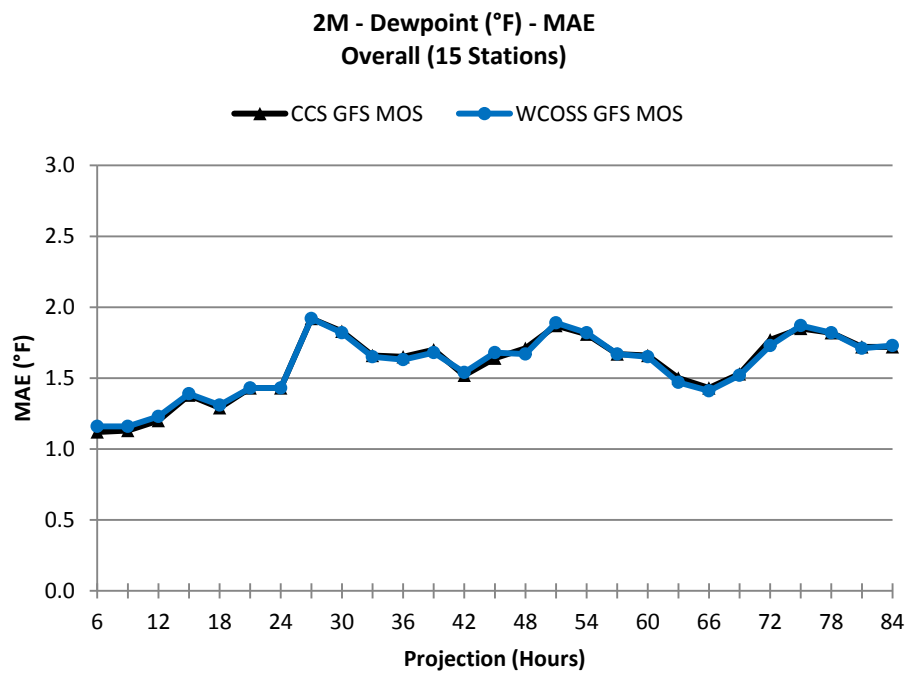
Metric:
MAE

Projection Hours:
6hr – 84hr

Station Sample:
Western Pacific – 15 Stations







Conclusion

- For the particular weather elements evaluated in this study, the verification scores for GFS MOS and NAM MOS forecasts generated on the CCS and WCOSS are very similar.

- While we don't anticipate a significant impact, MDL cannot definitively state that GFS MOS and/or NAM MOS forecasts will not experience any negative effects whatsoever from the production switch to the WCOSS platform.
  - Since we're relying upon gross verification statistics and very small sample sizes, it is difficult to detect any systematic biases specific to the WCOSS transition.
  - It is possible that there may be issues present during synoptic regimes or at times of the year not represented by this verification period.