# Status and Plans for Version-6 at SRT

**Joel Susskind, John Blaisdell**[1]**, Lena Iredell**[1]
NASA GSFC Laboratory for Atmospheres
Sounder Research Team

AIRS Science Team Meeting
April 27, 2011

1. SAIC

# Outline

- Highlights from April 7 Net-Meeting presentation
  - "Comparison of results run at JPL using different Start-up options"
- Further results related to Start-up options
- Comparison of JPL 2 Regression MODIS with SRT Version-5.44
  - SRT Version-5.44 is functionally equivalent to JPL 2 Regression MODIS with minor differences
- Improved cloud parameter retrievals using SRT Version-5.44
- Future plans for Version-6 at SRT

# Highlights from Net-Meeting

## Experiments We Have Run at JPL

All experiments used JPL Version-5.7.4 with three different start-up options
- Version-5.7.4 Baseline MODIS (two regression)
- Version-5.7.4 SCCNN
- Version-5.7.4 Climatology Physical

All experiments used MODIS 10 point emissivity initial guess over land

Each experiment was run in the AIRS/AMSU mode and in the AIRS Only mode

Each experiment was run for the same 6 days we use for experiments run at SRT
- September 6, 2002
- January 25, 2003
- September 29, 2004
- August 5, 2005
- February 24, 2007
- August 10, 2007
- May 30, 2010 added per request of Evan Manning

Validation is performed using colocated ECMWF as “truth” on 6 days

Trends include seven days as requested by Evan Manning

We have generated separate error estimate coefficients and QC thresholds to be used for, and only for, each experiment

We present results of QC’d T(p) and SST

# Methodology Used for T(p) Quality Control in Version-5

Define a profile dependent pressure, $p_{best}$, above which the temperature profile is flagged as best - otherwise flagged as bad

Use error estimate $\delta T(p)$ to determine $p_{best}$

Start from 70 mb and set $p_{best}$ to be the pressure at the first level below which $\delta T(p) > \text{threshold } \Delta T(p)$ for 3 consecutive layers

Temperature profile statistics include yield and errors of T(p) down to $p = p_{best}$

Version-5 used $\Delta T(p)$ thresholds optimized simultaneously for weather and climate : $\Delta T^{standard}(p)$

Subsequent experience showed $\Delta T^{standard}(p)$ was not optimal for data assimilation (too loose) or for climate (too tight)

Use of new tighter thresholds $\Delta T^{tight}(p)$ resulted in retrievals with lower yield but with RMS errors ≈1K

Tight QC performed much better when used in data assimilation experiments

Standard QC performed poorly in the lower troposphere over land

Standard QC defined cases with QC=0 in Version-5

A kluge was needed over land to generate cases with QC=1

# Methodology Used for T(p) Quality Control in Version-6

Essentially no retrievals are “left behind”

QC is applied to all cases in which a successful retrieval is performed

All successful retrievals have QC=0 down to 30 mb

QC is otherwise analogous to Version-5 but has tight thresholds $\Delta T_A(p)$ for data assimilation and loose thresholds $\Delta T_C(p)$ for climate applications

$\Delta T_A$ QC thresholds define $p_{best}$ (QC=0) and $\Delta T_C$ thresholds define $p_{good}$ (QC=0,1)

$\Delta T_A$ QC thresholds were set for each experiment so as to give RMS errors ≈1K

$\Delta T_C$ QC thresholds are used to generate level-3 gridded products

$\Delta T_C$ QC thresholds were set for each experiment so as to maximize coverage and achieve < 2K tropospheric RMS errors

# Performance Metrics

We evaluate each start-up option in terms of accuracy as a function of % yield

We compare yields and RMS errors for each experiment using their own QC thresholds

**Ability to do effective QC is critical for a given system**

We also compare RMS errors for each experiment using 2 common sets of cases

1) All cases accepted by Version-5 Tight QC

   How do start-up options compare on less challenging cases?

2) All cases accepted by SCCNN climate QC

   How much do start-up options degrade under challenging but doable cases

Tropospheric Temperature Metric (TTM) is the average RMS error for all 1 km layers between 1000 mb and 100 mb

Yield Metric (YM) is the average % yield for all 1 km layers between 1000 mb and 100 mb

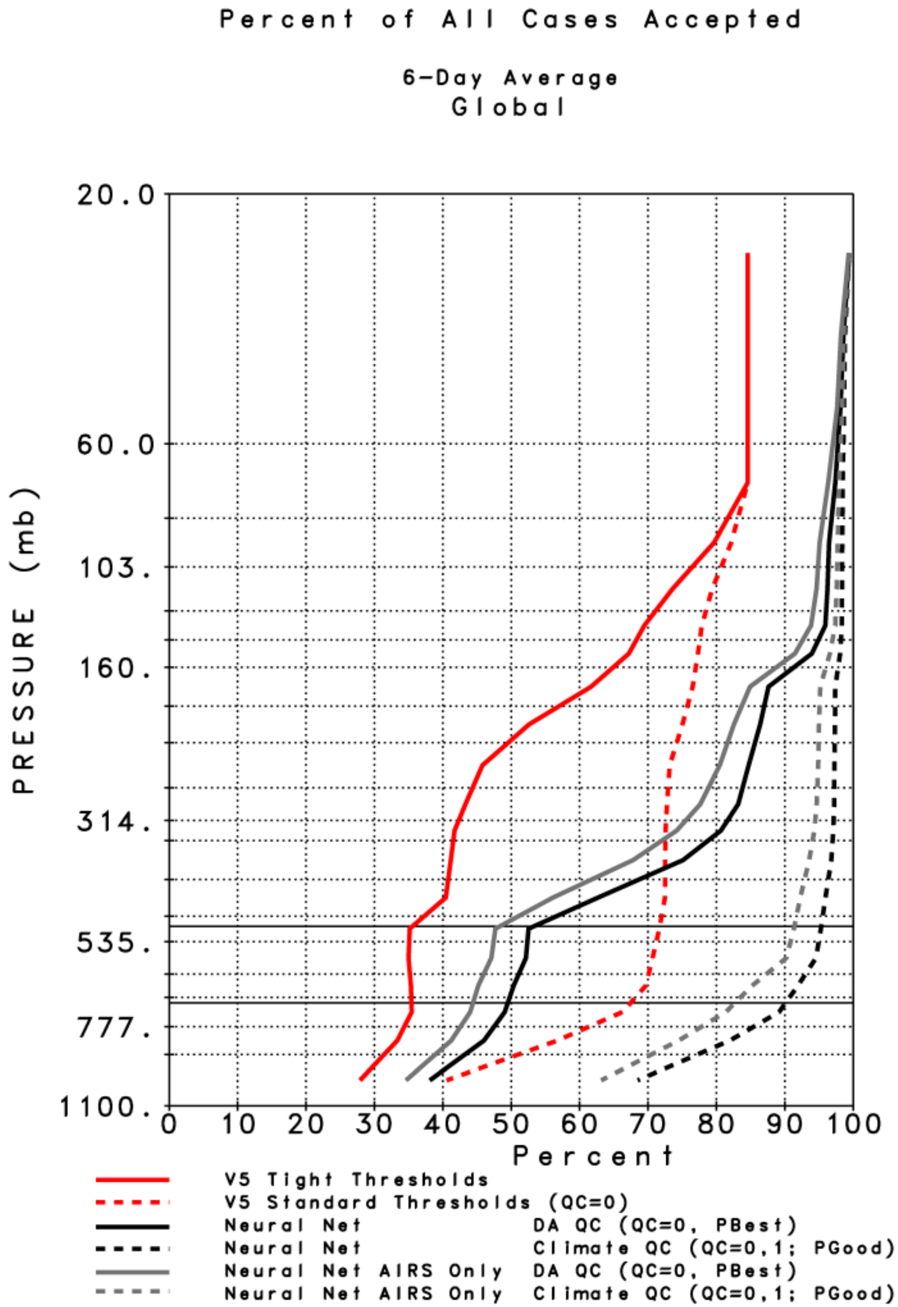
A start-up option must perform well in the AIRS Only mode to be acceptable for Version-6

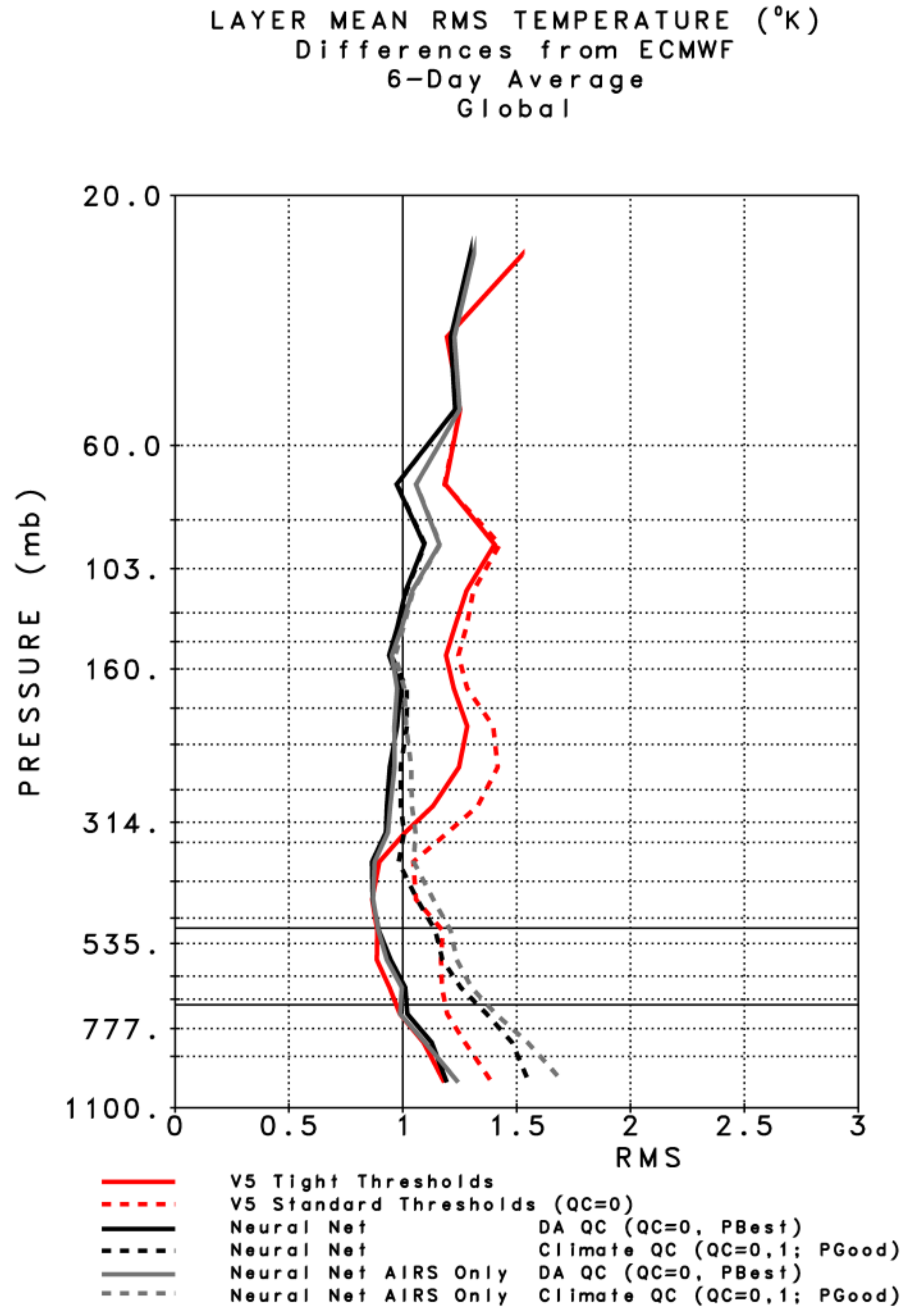
A start-up option must also result in minimal yield and temperature bias trends

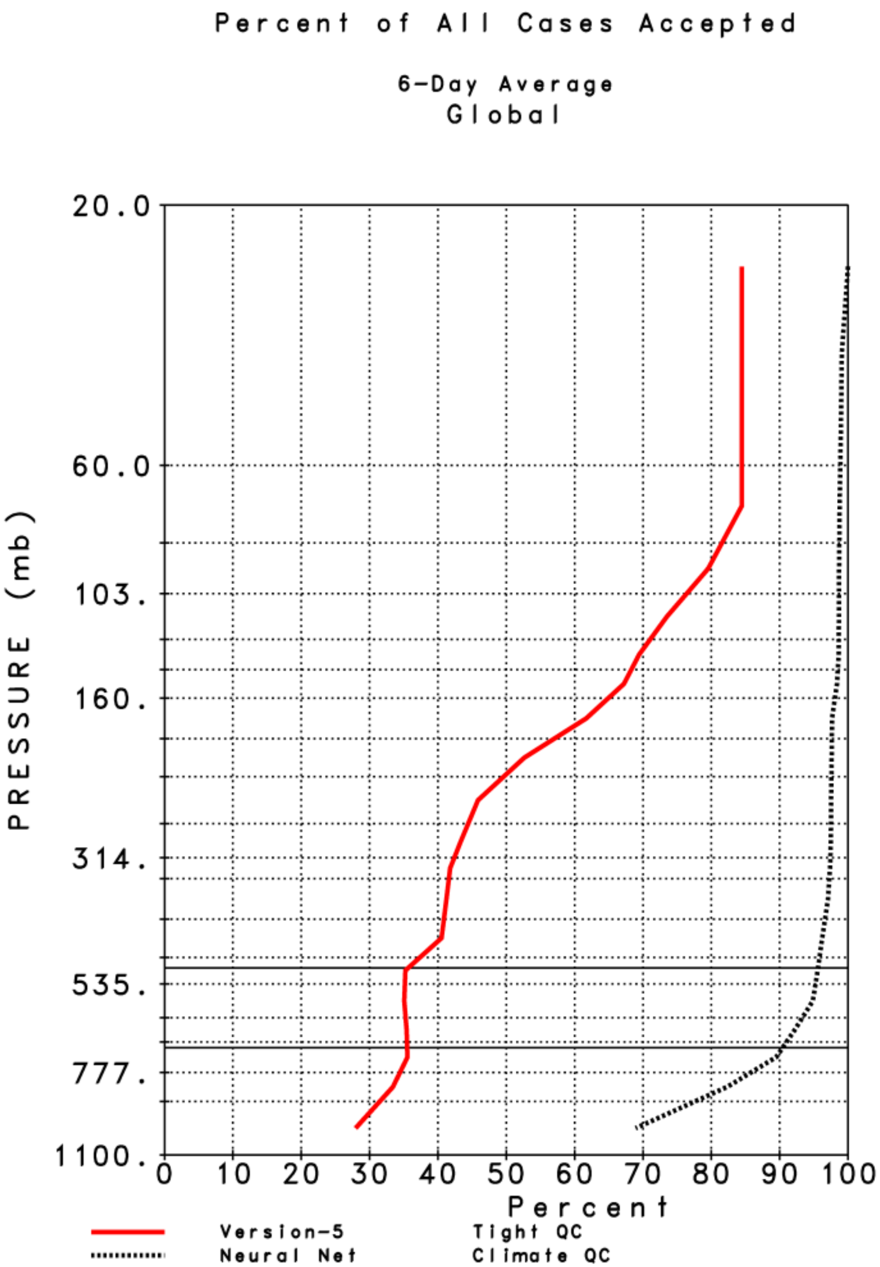
# Comparisons Shown

We first compare Version-6 SCCNN and SCCNNAO with Version-5 Tight and Version-5 Standard

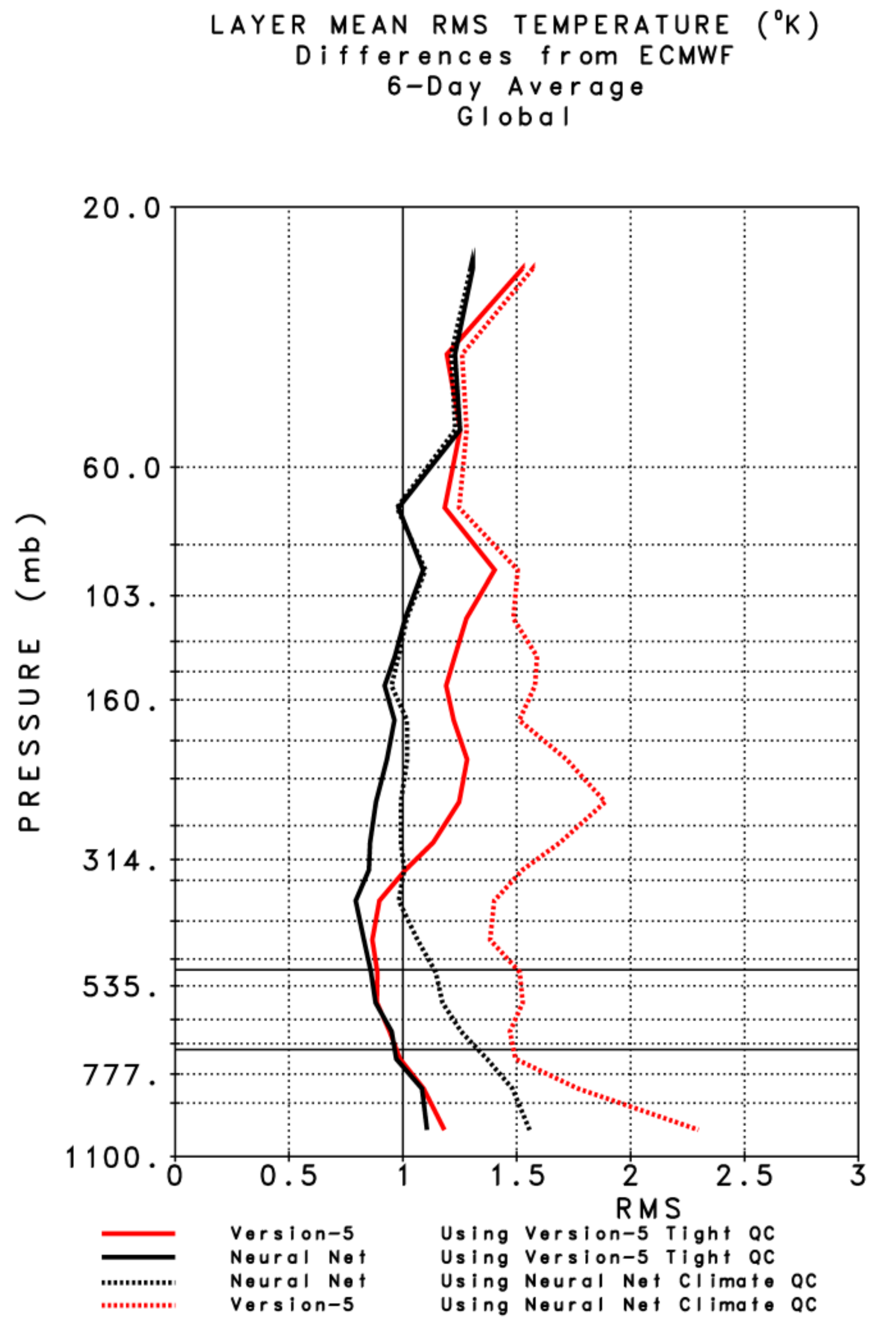
We then compare Version-6 Regression, Climatology, and SCCNN with each other, including AO runs


Percent of All Cases Accepted
6-Day Average
Global
PRESSURE (mb)
20.0
60.0
103.
160.
314.
535.
777.
1100.
0 10 20 30 40 50 60 70 80 90 100
Percent
V5 Tight Thresholds
V5 Standard Thresholds (QC=0)
Neural Net DA QC (QC=0, PBest)
Neural Net Climate QC (QC=0,1; PGood)
Neural Net AIRS Only DA QC (QC=0, PBest)
Neural Net AIRS Only Climate QC (QC=0,1; PGood)


LAYER MEAN RMS TEMPERATURE (°K)
Differences from ECMWF
6-Day Average
Global
PRESSURE (mb)
20.0
60.0
103.
160.
314.
535.
777.
1100.
0 0.5 1 1.5 2 2.5 3
RMS
V5 Tight Thresholds
V5 Standard Thresholds (QC=0)
Neural Net DA QC (QC=0, PBest)
Neural Net Climate QC (QC=0,1; PGood)
Neural Net AIRS Only DA QC (QC=0, PBest)
Neural Net AIRS Only Climate QC (QC=0,1; PGood)

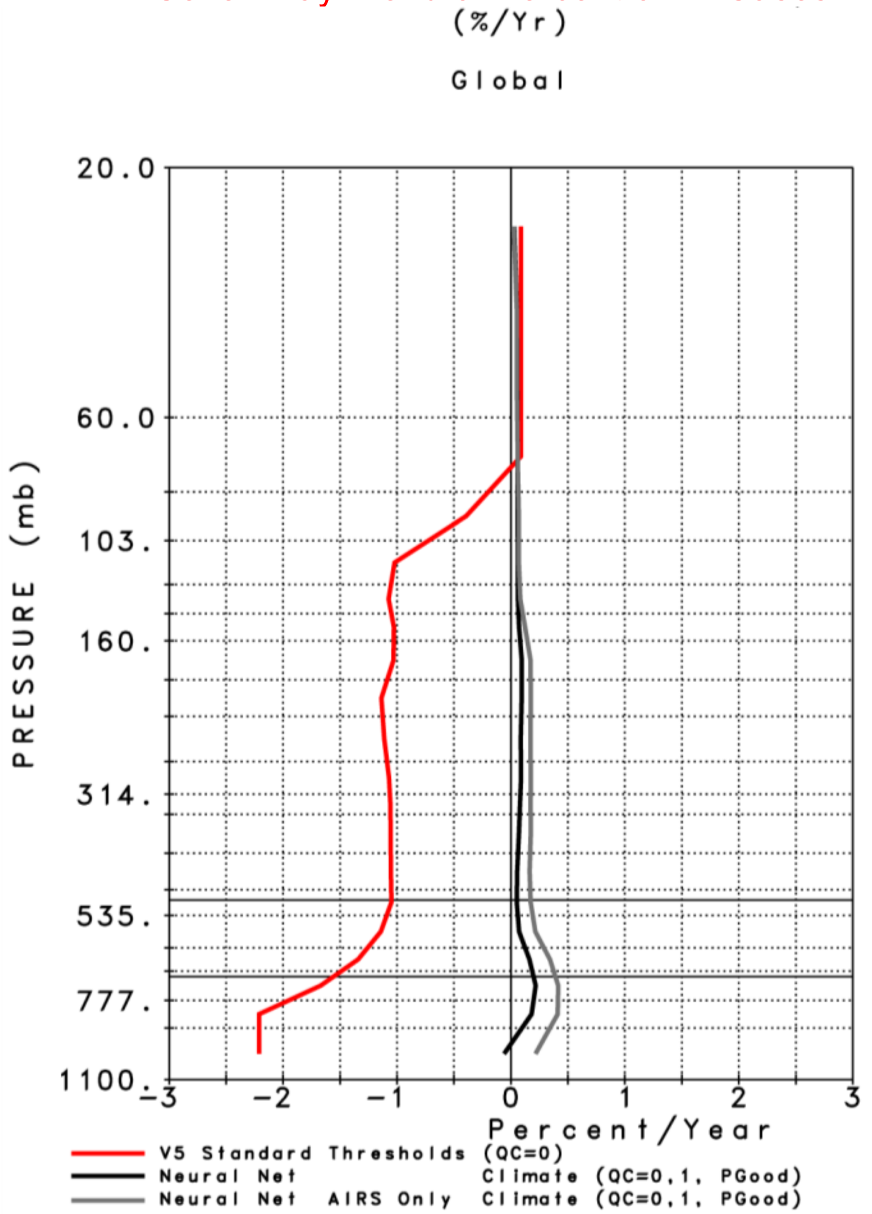


Percent of All Cases Accepted
6-Day Average
Global
PRESSURE (mb)
20.0
60.0
103.
160.
314.
535.
777.
1100.
0 10 20 30 40 50 60 70 80 90 100
Percent
Version-5 Tight QC
Neural Net Climate QC

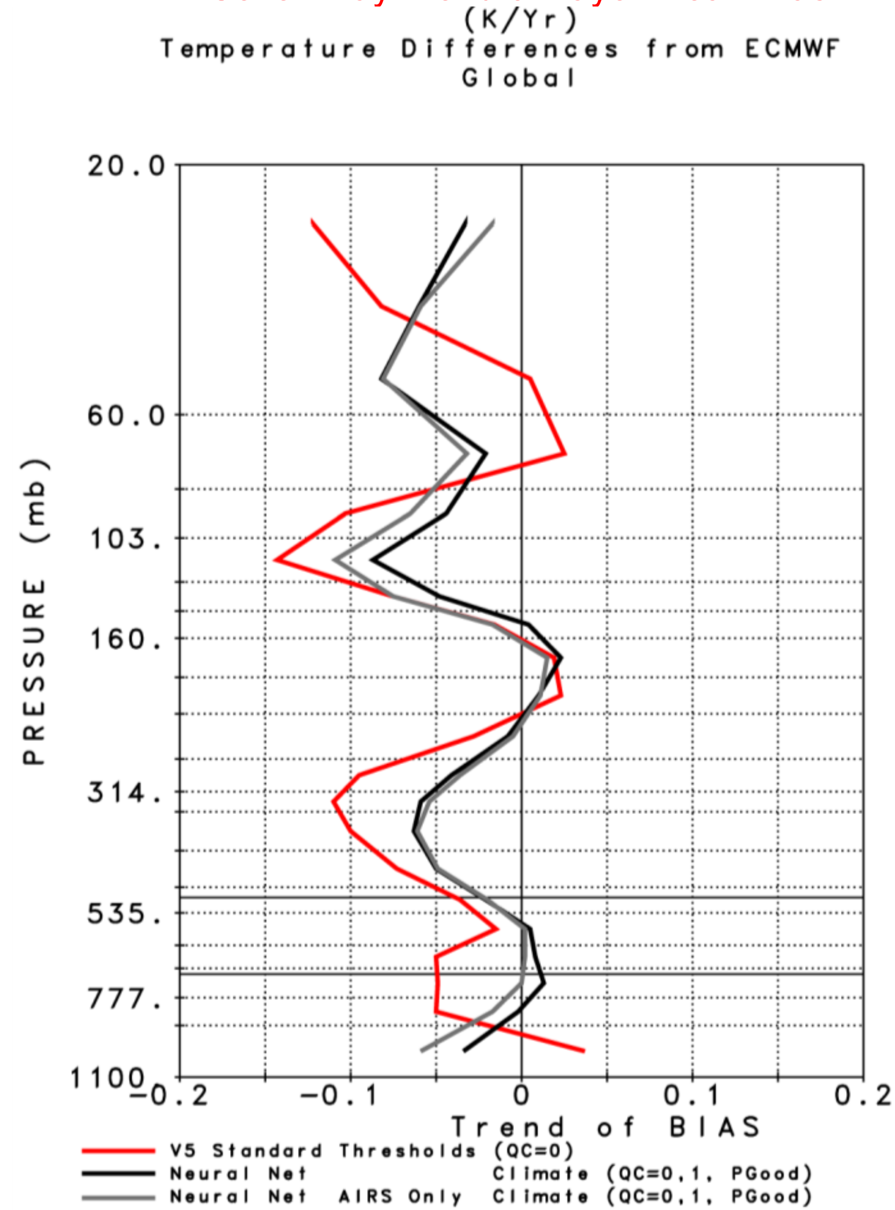



LAYER MEAN RMS TEMPERATURE (°K)
Differences from ECMWF
6-Day Average
Global
PRESSURE (mb)
20.0
60.0
103.
160.
314.
535.
777.
1100.
0 0.5 1 1.5 2 2.5 3
RMS
Version-5 Using Version-5 Tight QC
Neural Net Using Version-5 Tight QC
Neural Net Using Neural Net Climate QC
Version-5 Using Neural Net Climate QC

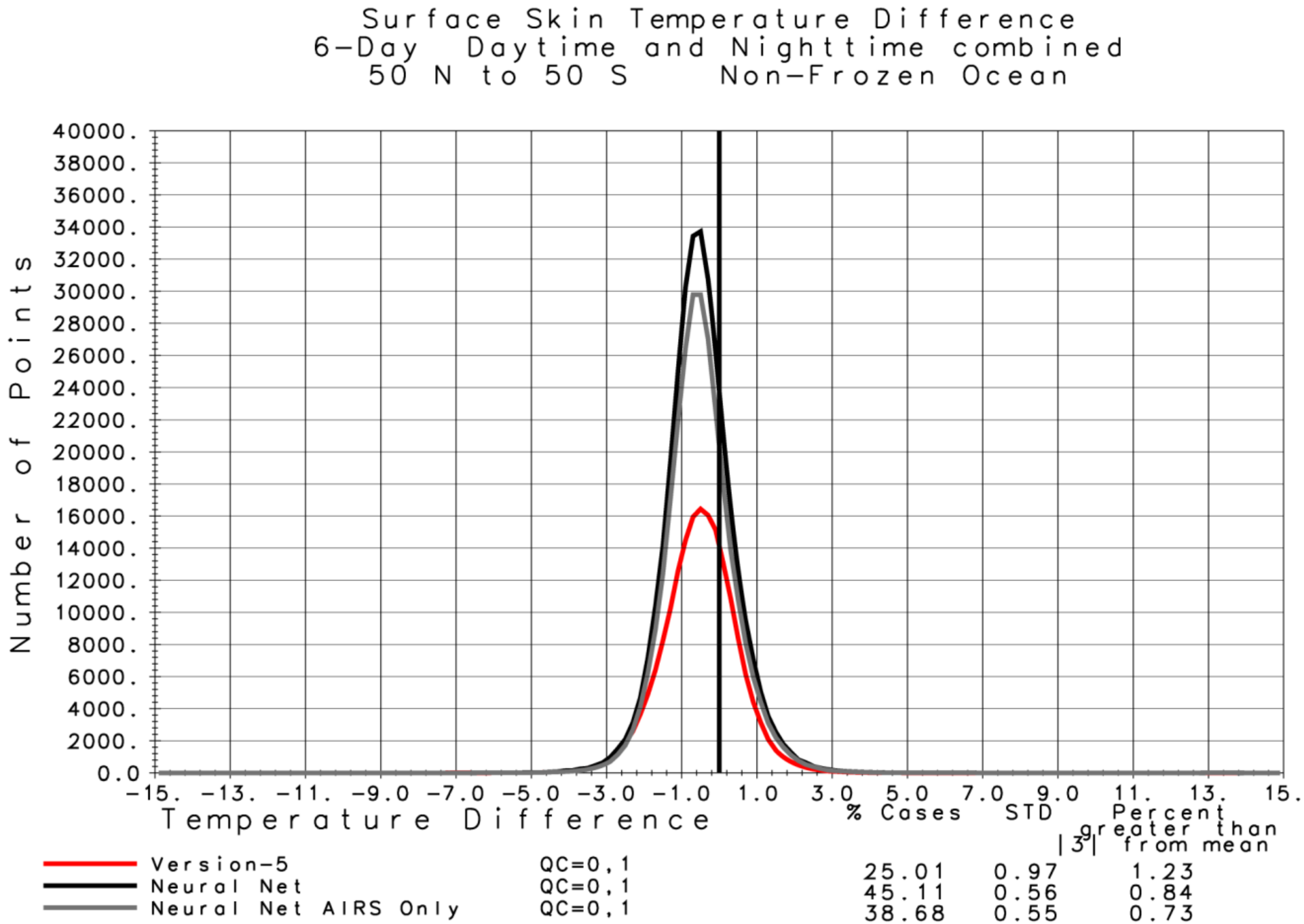
## Seven Day Trend of Percent of All Cases




## Seven Day Trend of Layer Mean Bias




Joel Susskind, John Blaisdell, Lena Iredell



Surface Skin Temperature Difference
6-Day Daytime and Nighttime combined
50 N to 50 S Non-Frozen Ocean
Number of Points
40000.
38000.
36000.
34000.
32000.
30000.
28000.
26000.
24000.
22000.
20000.
18000.
16000.
14000.
12000.
10000.
8000.
6000.
4000.
2000.
0.0
-15. -13. -11. -9.0 -7.0 -5.0 -3.0 -1.0 1.0 3.0 5.0 7.0 9.0 11. 13. 15.
Temperature Difference
% Cases STD Percent greater than |3| from mean
Version-5 QC=0,1 25.01 0.97 1.23
Neural Net QC=0,1 45.11 0.56 0.84
Neural Net AIRS Only QC=0,1 38.68 0.55 0.73

# Comparison of Version-6 Neural-Net with Version-5

**Version-6 Neural-Net performs significantly better than Version-5 in all regards**

Temperature Profile

- Yield using Data Assimilation QC is much greater than Version-5 tight with comparable RMS errors
- Yield using Climate QC is much greater than Version-5 standard with good RMS errors
- Lower tropospheric Neural-Net retrievals have comparable or better accuracy than Version-5 for less challenging cases
- Version-5 retrievals degrade much faster than Neural-Net retrievals for difficult cases
- Improvement over Version-5 is largest over land

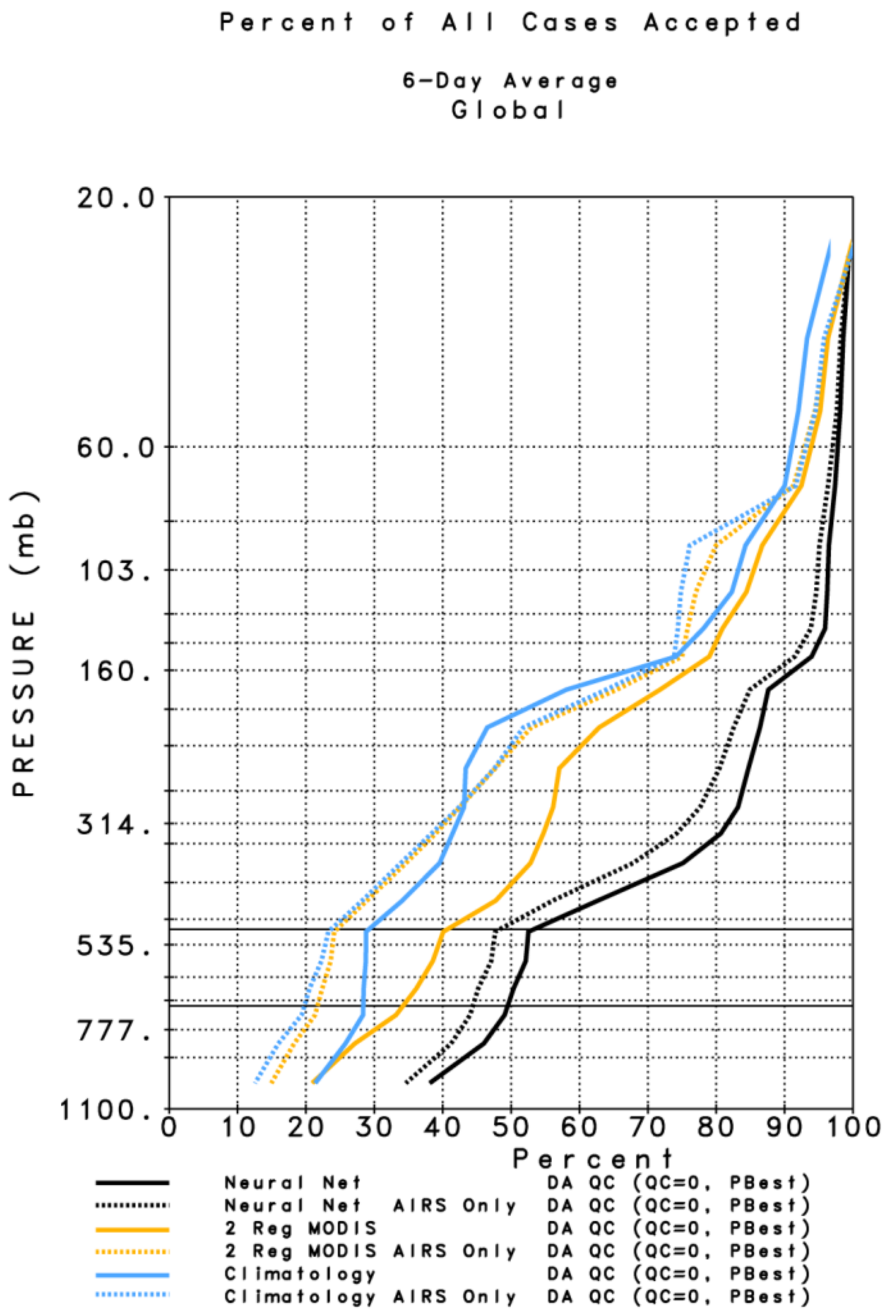
Bias Trends

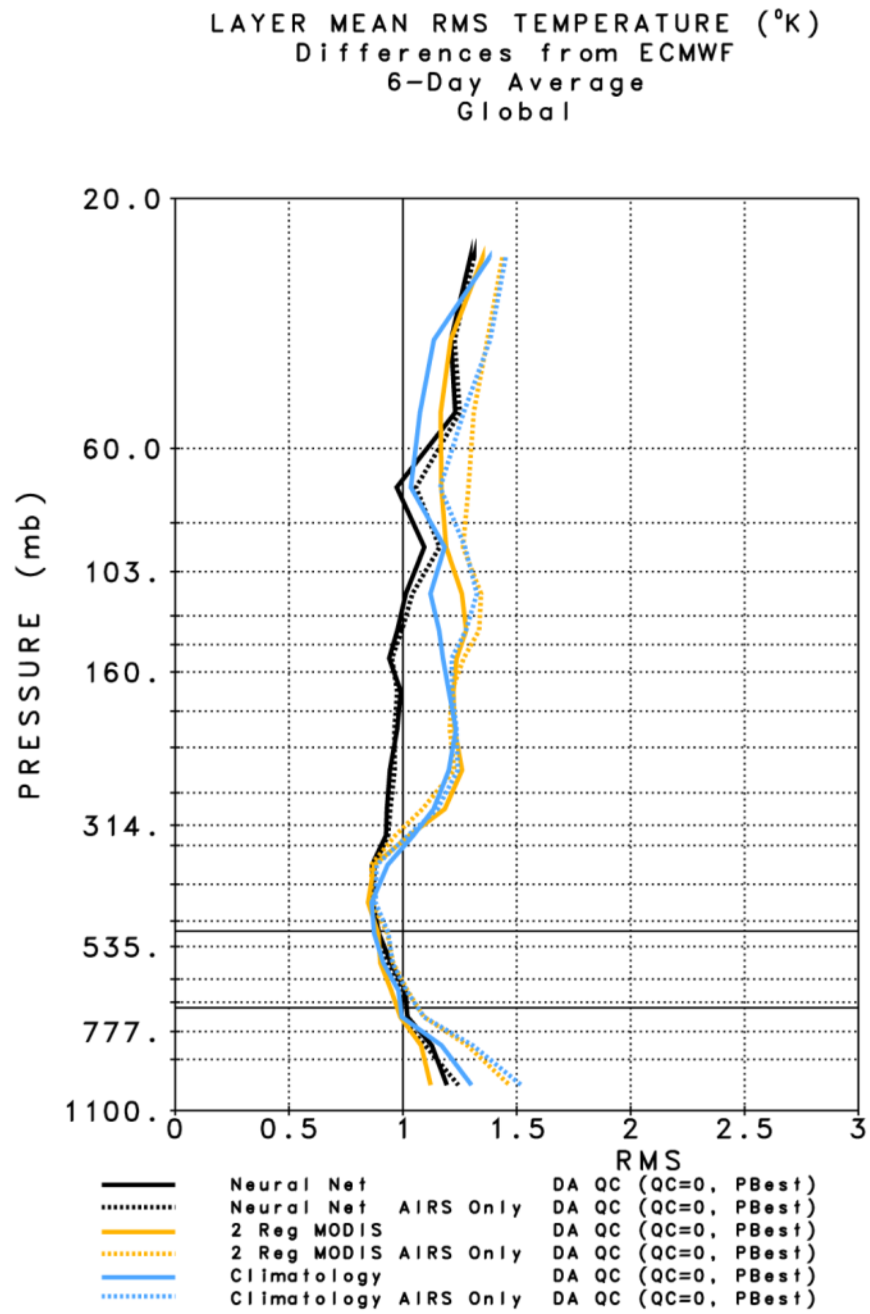
Neural-Net yield and spurious bias trends are significantly better than Version-5

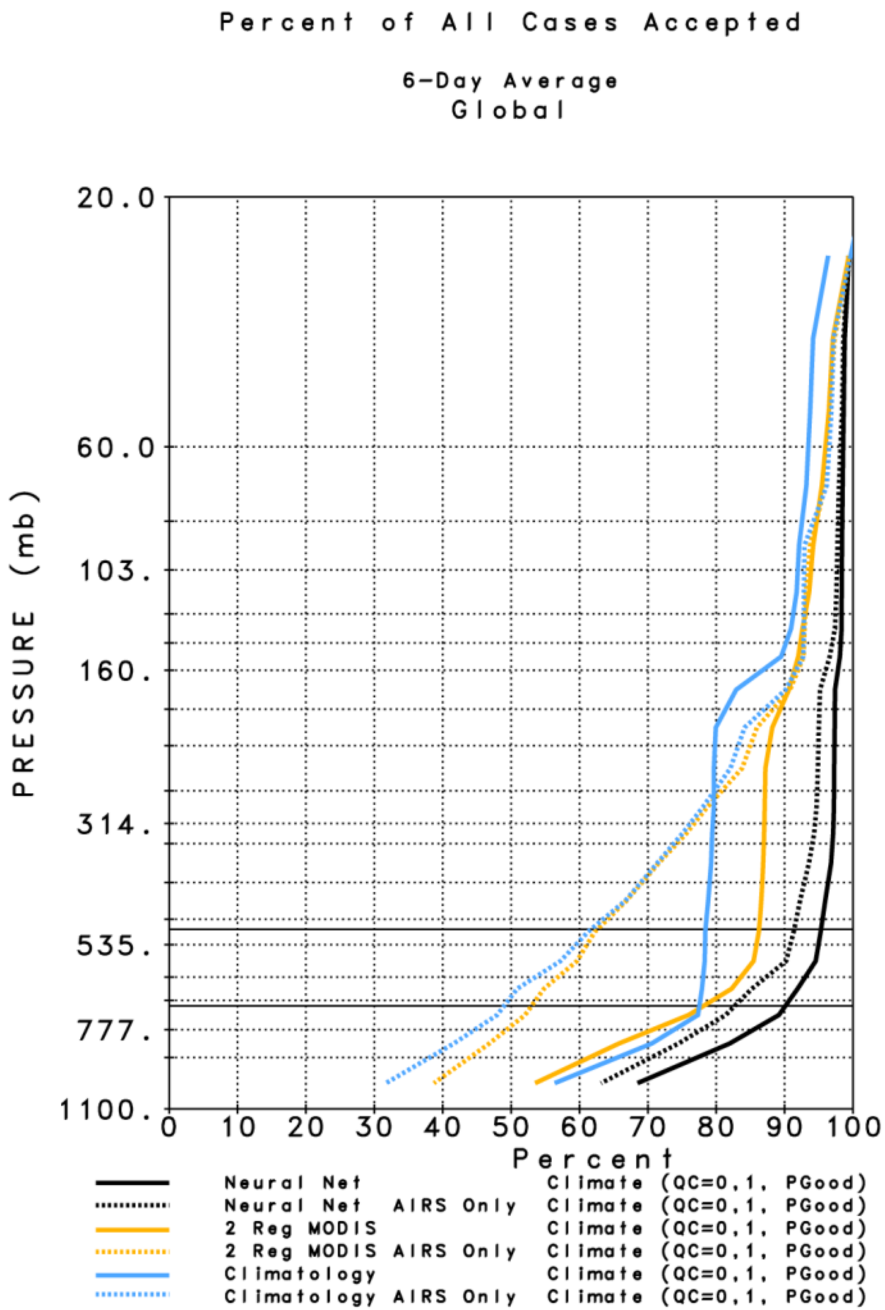
Sea Surface Temperature (SST)

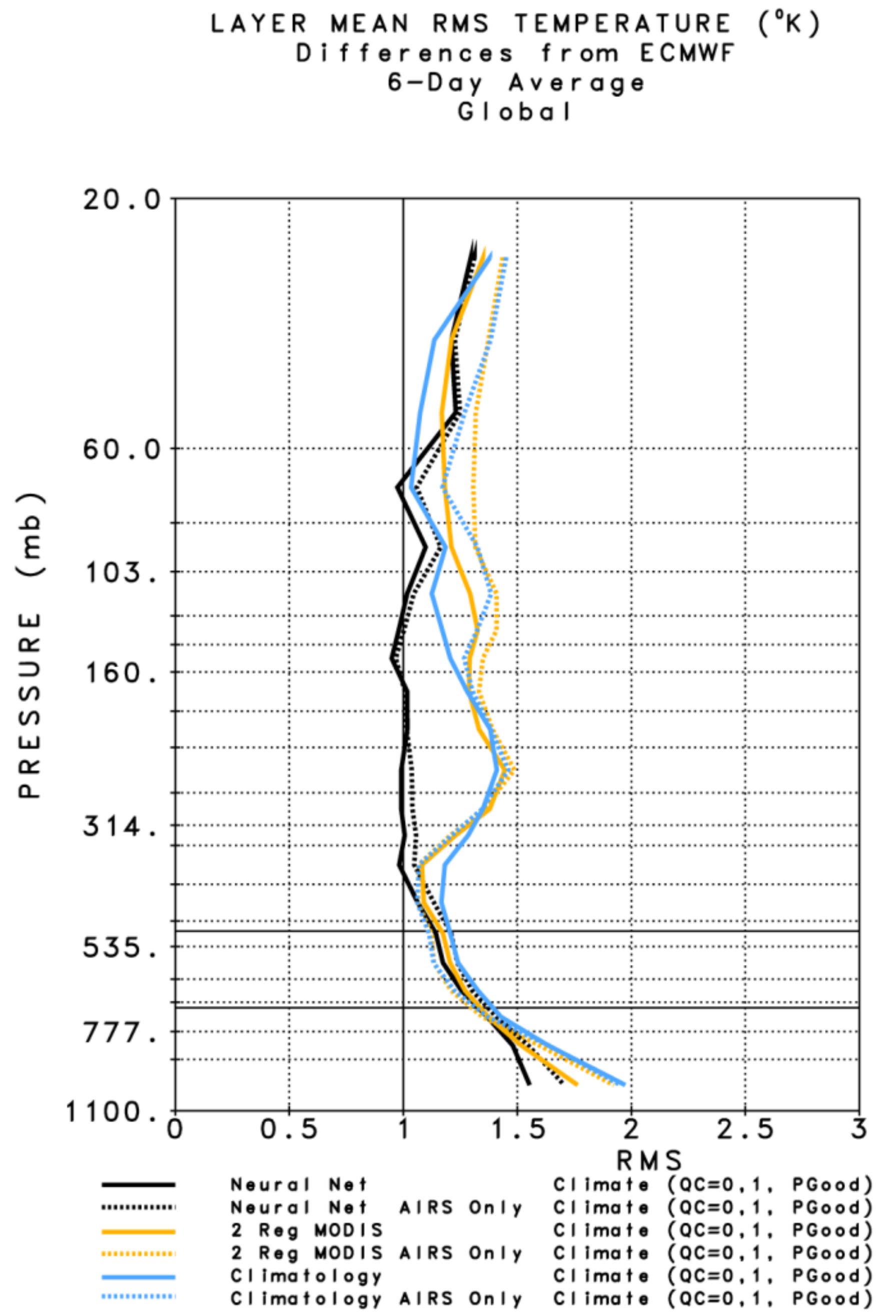
Neural-Net SST’s have significantly higher yields and better accuracy than Version-5

**Neural-Net AO retrieval performance is only marginally poorer than Neural-Net using AIRS/AMSU**


Percent of All Cases Accepted
6-Day Average
Global
PRESSURE (mb)
20.0
60.0
103.
160.
314.
535.
777.
1100.
0 10 20 30 40 50 60 70 80 90 100
Percent
Neural Net DA QC (QC=0, PBest)
Neural Net AIRS Only DA QC (QC=0, PBest)
2 Reg MODIS DA QC (QC=0, PBest)
2 Reg MODIS AIRS Only DA QC (QC=0, PBest)
Climatology DA QC (QC=0, PBest)
Climatology AIRS Only DA QC (QC=0, PBest)


LAYER MEAN RMS TEMPERATURE (°K)
Differences from ECMWF
6-Day Average
Global
PRESSURE (mb)
20.0
60.0
103.
160.
314.
535.
777.
1100.
0 0.5 1 1.5 2 2.5 3
RMS
Neural Net DA QC (QC=0, PBest)
Neural Net AIRS Only DA QC (QC=0, PBest)
2 Reg MODIS DA QC (QC=0, PBest)
2 Reg MODIS AIRS Only DA QC (QC=0, PBest)
Climatology DA QC (QC=0, PBest)
Climatology AIRS Only DA QC (QC=0, PBest)




Joel Susskind, John Blaisdell, Lena Iredell

## Tropospheric Temperature Performance Metric Using Own Data Assimilation Thresholds

| | Global | | Land ±50˚ | | Ocean ±50˚ | | Poleward of 50˚N | | Poleward of 50˚S | |
|---|---|---|---|---|---|---|---|---|---|---|
| | YM(%) | TTM(K) | YM(%) | TTM(K) | YM(%) | TTM(K) | YM(%) | TTM(K) | YM(%) | TTM(K) |
| Version-5 Tight | 46.2 | 1.08 | 42.0 | 1.17 | 60.9 | 1.02 | 35.9 | 1.15 | 31.2 | 1.30 |
| Neural-Net | 70.9 | 0.98 | 74.6 | 0.96 | 78.6 | 0.89 | 65.4 | 1.03 | 57.9 | 1.20 |
| 2 Regression MODIS | 52.7 | 1.08 | 53.5 | 1.10 | 62.8 | 0.99 | 48.6 | 1.21 | 36.5 | 1.27 |
| Climatology | 43.9 | 1.08 | 44.8 | 1.06 | 57.1 | 1.00 | 34.5 | 1.29 | 27.3 | 1.39 |
| Neural-Net AO | 66.5 | 0.98 | 72.6 | 1.00 | 76.8 | 0.91 | 56.9 | 1.01 | 50.4 | 1.22 |
| 2 Regression MODIS AO | 41.4 | 1.13 | 44.0 | 1.22 | 51.1 | 1.04 | 36.9 | 1.23 | 25.5 | 1.31 |
| Climatology AO | 40.2 | 1.14 | 39.9 | 1.22 | 49.3 | 1.07 | 35.6 | 1.25 | 27.5 | 1.26 |

## Tropospheric Temperature Performance Metrics Using Own Climate Thresholds

| | Global | | Land ±50˚ | | Ocean ±50˚ | | Poleward of 50˚N | | Poleward of 50˚S | |
|---|---|---|---|---|---|---|---|---|---|---|
| | YM(%) | TTM(K) | YM(%) | TTM(K) | YM(%) | TTM(K) | YM(%) | TTM(K) | YM(%) | TTM(K) |
| Version-5 Standard | 70.3 | 1.25 | 70.2 | 1.34 | 72.6 | 1.07 | 69.3 | 1.30 | 66.0 | 1.45 |
| Neural-Net | 93.4 | 1.12 | 91.5 | 1.06 | 96.7 | 1.04 | 90.8 | 1.16 | 90.9 | 1.31 |
| 2 Regression MODIS | 83.8 | 1.32 | 83.1 | 1.30 | 86.6 | 1.15 | 83.6 | 1.42 | 78.6 | 1.55 |
| Climatology | 79.4 | 1.34 | 76.9 | 1.25 | 84.8 | 1.18 | 76.6 | 1.48 | 73.4 | 1.58 |
| Neural-Net AO | 89.8 | 1.17 | 89.0 | 1.11 | 96.1 | 1.09 | 83.5 | 1.20 | 83.9 | 1.41 |
| 2 Regression MODIS AO | 71.7 | 1.34 | 75.8 | 1.40 | 79.5 | 1.22 | 69.6 | 1.43 | 54.6 | 1.48 |
| Climatology AO | 69.8 | 1.33 | 70.5 | 1.40 | 78.2 | 1.25 | 67.3 | 1.42 | 54.7 | 1.41 |

# Further Results Related to Start-up Options

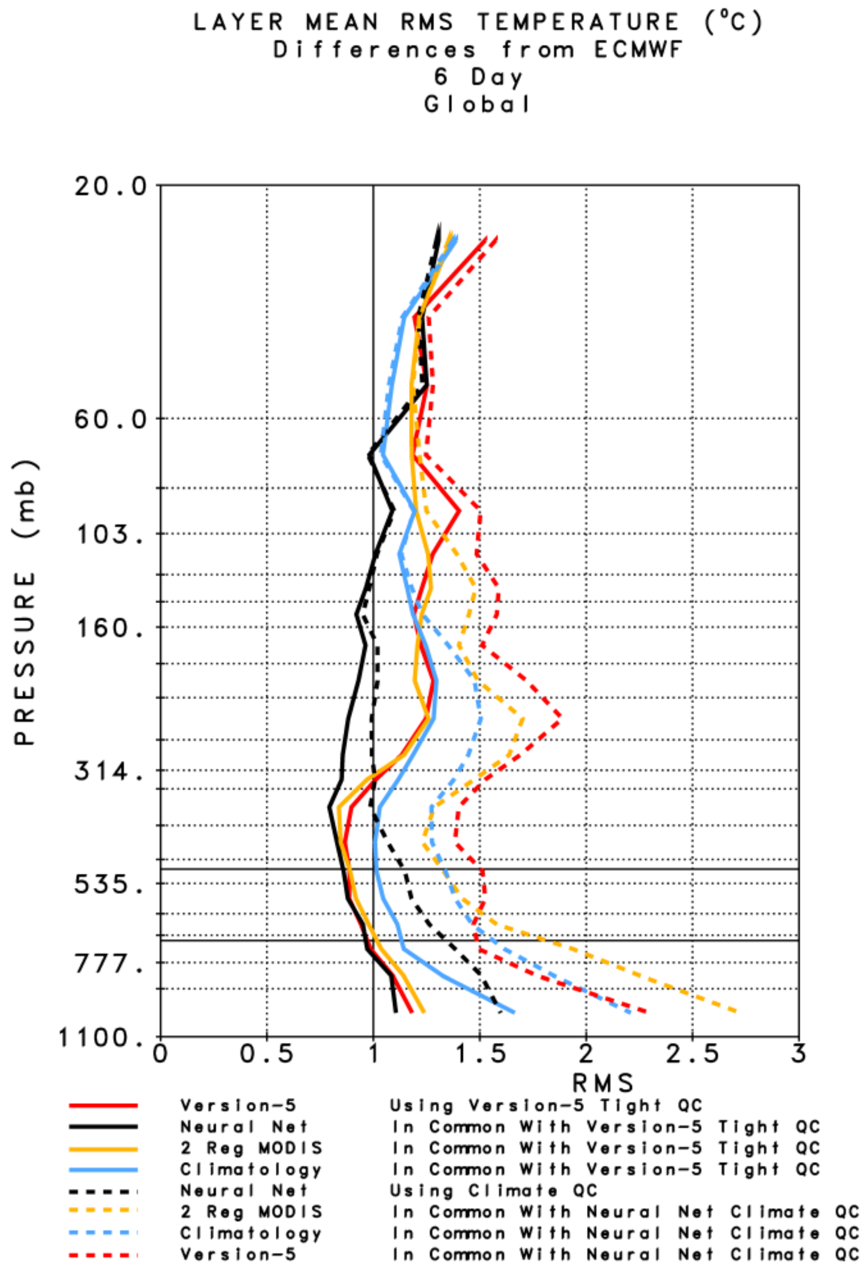
1) Results shown at April Net-meeting for 6 days using ensembles in common were incorrect. They did not contain all 6 days. We have corrected plots and tables.

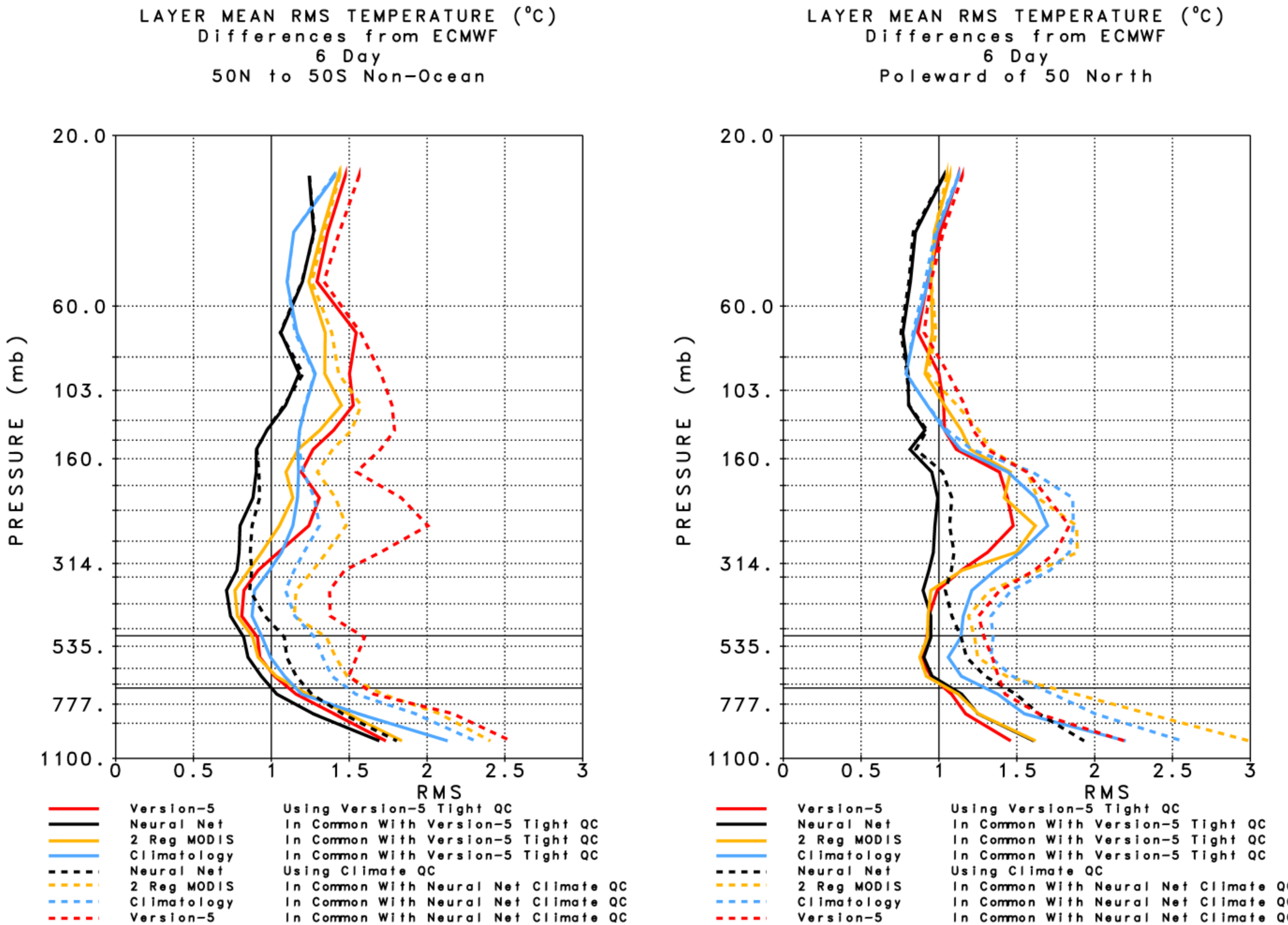
2) New table showing Boundary Layer Metric for common ensembles.

   Boundary Layer Metric is the average RMS difference from ECMWF for the four lowest of the 100 layers above the surface (1 km).

   N.B. These are 0.25 km layers.

3) Results shown for cases in common include Neural-Net guess and Version-5 Clear Regression guess

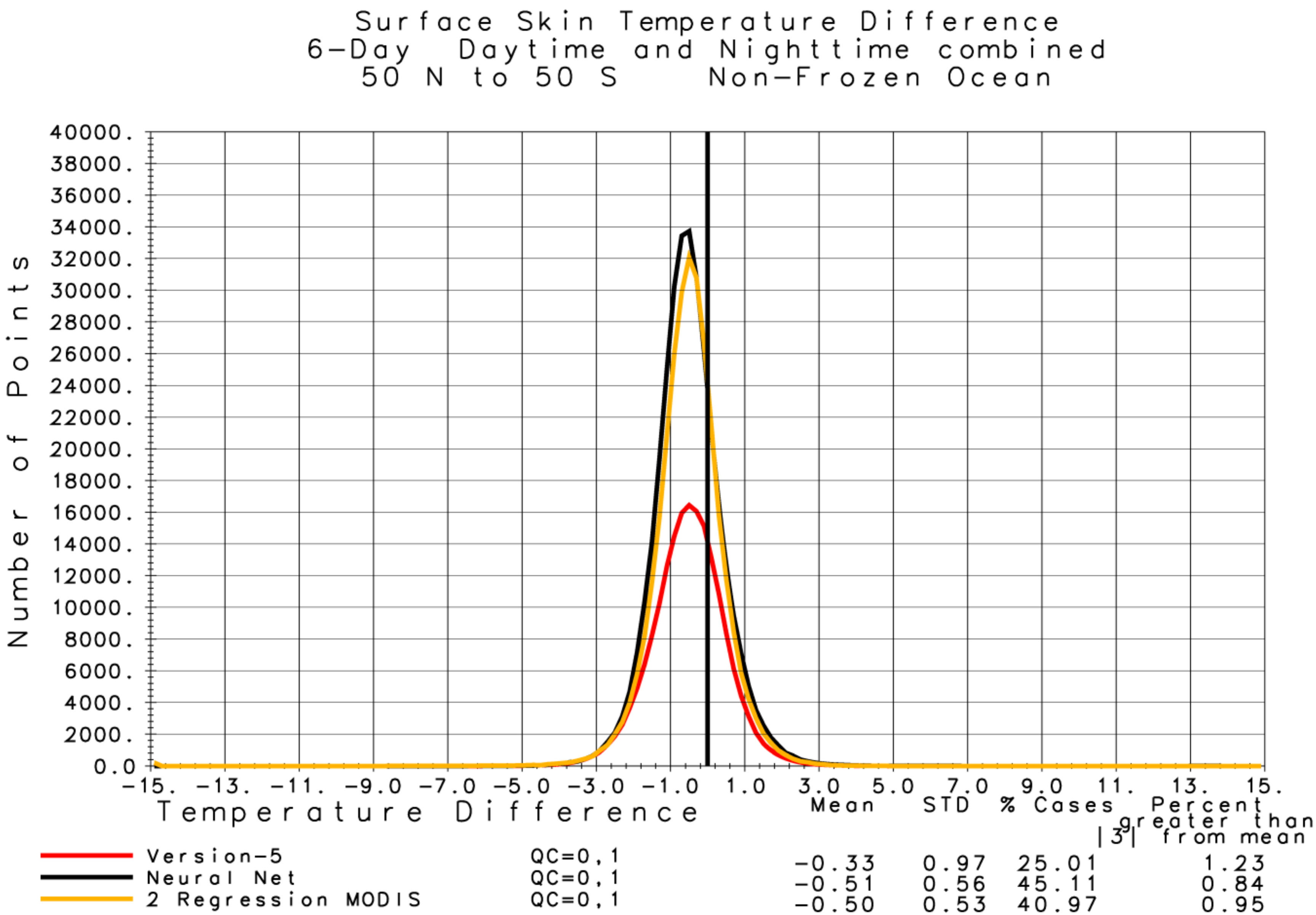

LAYER MEAN RMS TEMPERATURE (°C)
Differences from ECMWF
6 Day
Global
PRESSURE (mb)
20.0
60.0
103.
160.
314.
535.
777.
1100.
0
0.5
1
1.5
2
2.5
3
RMS
Version-5 Using Version-5 Tight QC
Neural Net In Common With Version-5 Tight QC
2 Reg MODIS In Common With Version-5 Tight QC
Climatology In Common With Version-5 Tight QC
Neural Net Using Climate QC
2 Reg MODIS In Common With Neural Net Climate QC
Climatology In Common With Neural Net Climate QC
Version-5 In Common With Neural Net Climate QC




Joel Susskind, John Blaisdell, Lena Iredell

| TTM (BLM) Metric Using the Version-5 Tight Ensemble | | | | | |
|---|---|---|---|---|---|
| | Global | Land ±50˚ | Ocean ±50˚ | Poleward of 50˚N | Poleward of 50˚S |
| Version-5 | 1.08 (1.27) | 1.17 (1.69) | 1.02 (1.11) | 1.15 (1.49) | 1.30 (1.74) |
| Neural-Net | 0.93 (1.18) | 0.95 (1.53) | 0.87 (1.00) | 1.00 (1.51) | 1.19 (1.73) |
| 2 Regression MODIS | 1.09 (1.34) | 1.12 (1.80) | 0.99 (1.16) | 1.20 (1.60) | 1.36 (1.81) |
| Climatology | 1.18 (1.73) | 1.17 (1.94) | 1.11 (1.53) | 1.35 (2.11) | 1.47 (2.51) |
| Neural-Net AO | 0.96 (1.34) | 0.99 (1.70) | 0.88 (1.14) | 1.05 (1.76) | 1.27 (1.91) |
| 2 Regression MODIS AO | 1.12 (1.37) | 1.16 (1.87) | 1.02 (1.20) | 1.22 (1.60) | 1.42 (1.81) |
| Climatology AO | 1.10 (1.36) | 1.16 (1.80) | 1.03 (1.21) | 1.19 (1.57) | 1.32 (1.79) |

| TTM (BLM) Metric Using the Neural-Net Climate Ensemble | | | | | |
|---|---|---|---|---|---|
| | Global | Land ±50˚ | Ocean ±50˚ | Poleward of 50˚N | Poleward of 50˚S |
| Version-5 | 1.62 (2.28) | 1.72 (2.43) | 1.58 (2.16) | 1.50 (2.15) | 1.73 (2.55) |
| Neural-Net | 1.13 (1.75) | 1.07 (1.84) | 1.05 (1.38) | 1.17 (2.02) | 1.33 (2.22) |
| 2 Regression MODIS | 1.61 (2.84) | 1.50 (2.58) | 1.54 (2.62) | 1.62 (3.09) | 1.84 (3.33) |
| Climatology | 1.44 (2.38) | 1.36 (2.35) | 1.30 (1.88) | 1.58 (2.70) | 1.66 (3.16) |
| Neural-Net AO | 1.24 (2.07) | 1.15 (2.02) | 1.10 (1.58) | 1.34 (2.67) | 1.49 (2.57) |
| 2 Regression MODIS AO | 2.41 (4.59) | 2.30 (3.69) | 2.68 (5.27) | 1.98 (3.90) | 2.15 (3.82) |
| Climatology AO | 2.60 (4.57) | 2.51 (3.96) | 2.98 (5.20) | 2.07 (3.84) | 2.12 (3.78) |


Surface Skin Temperature Difference
6-Day Daytime and Nighttime combined
50 N to 50 S Non-Frozen Ocean
Number of Points
Temperature Difference
Mean STD % Cases Percent greater than |3| from mean
Version-5 QC=0,1 -0.33 0.97 25.01 1.23
Neural Net QC=0,1 -0.51 0.56 45.11 0.84
2 Regression MODIS QC=0,1 -0.50 0.53 40.97 0.95

# Comparison of Version-6 Neural-Net Start-up with 2 Regression and Climatology

**Version-6 Neural-Net performs significantly better than other start-ups**

Temperature Profile

- Neural-Net Yield using Data Assimilation QC is much greater than either other start-up with better RMS errors
- Neural-Net Yield using Climate QC is much greater than either other start-up with significantly better RMS errors
- Neural-Net retrievals degrade more slowly than other start-up retrievals for difficult cases in common

- Climatology start-up performs poorer than 2 Regression for less challenging cases in common
- Climatology start-up performs better than 2 Regression for difficult cases in common – climatology start-up degrades more slowly

- Neural-Net AO retrieval performance is only marginally poorer than Neural-Net using AIRS/AMSU
- 2 Regression and Climatology systems degrade significantly in AO mode for harder cases

# Comparison of Boundary Layer Temperatures

Comparisons done on common ensembles

- Easier cases selected using Version-5 Tight QC
- Harder cases selected using Neural-Net Climate QC

Easier cases

- Climatology is significantly poorest globally and for all regions
- Version-5 outperforms Version-6  2 Regression MODIS in all spatial regions
- Neural-Net outperforms Version-5 globally and in mid-latitude land and ocean
- Neural-Net is slightly poorer than Version-5 poleward of 50˚N

Harder cases

- Neural-Net is significantly better than all other systems in all regions
- Version-5 is much better than Version-6  2 Regression MODIS in all regions

# Overall Assessment by SRT

The Version-6 Neural-Net Start-up option performs significantly better than all others in just about every way – including Version-5

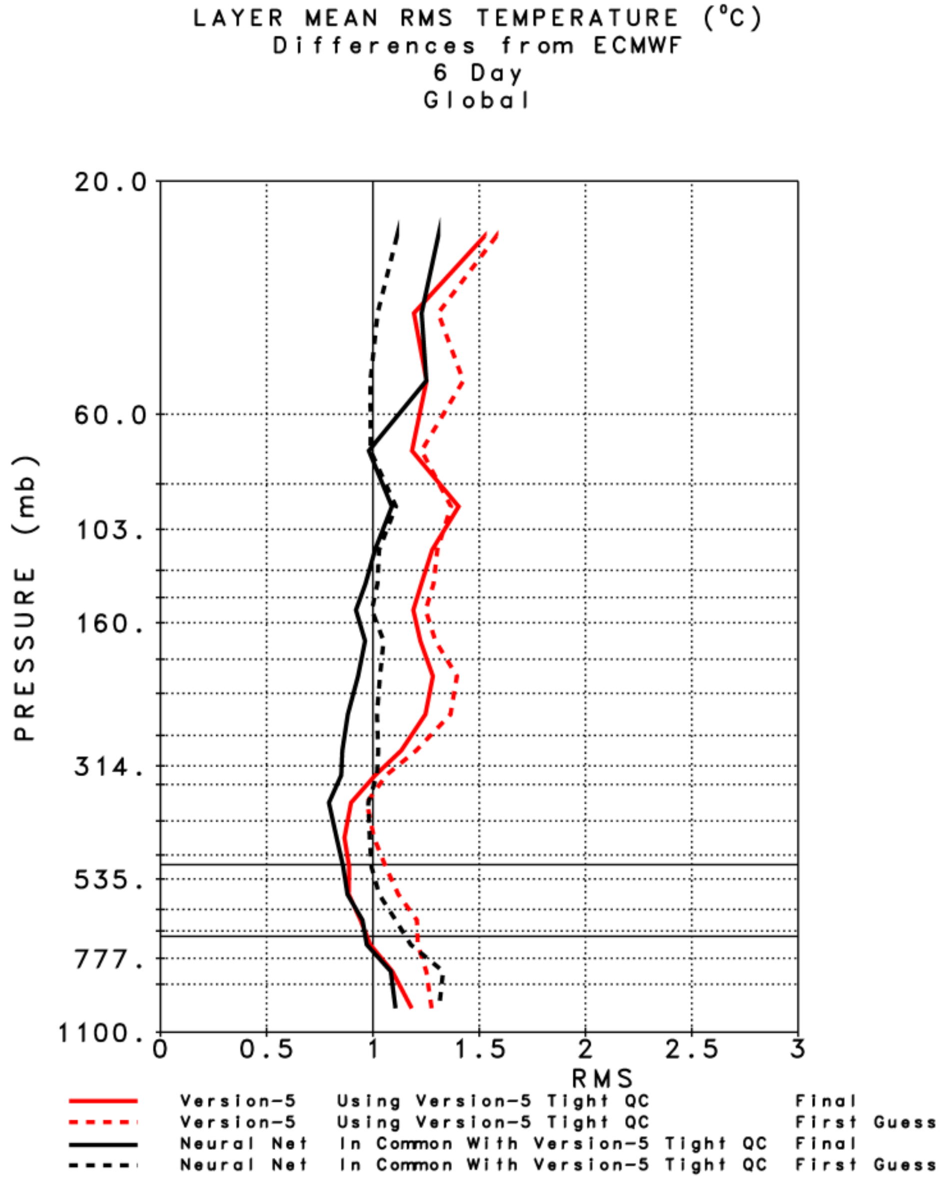
This conclusion was also reached by all speakers at the April 7 Net-Meeting

The fact that Version-6 Neural-Net boundary layer retrievals are somewhat poorer than Version-5 poleward of 50˚N is troubling but this is not a show stopper

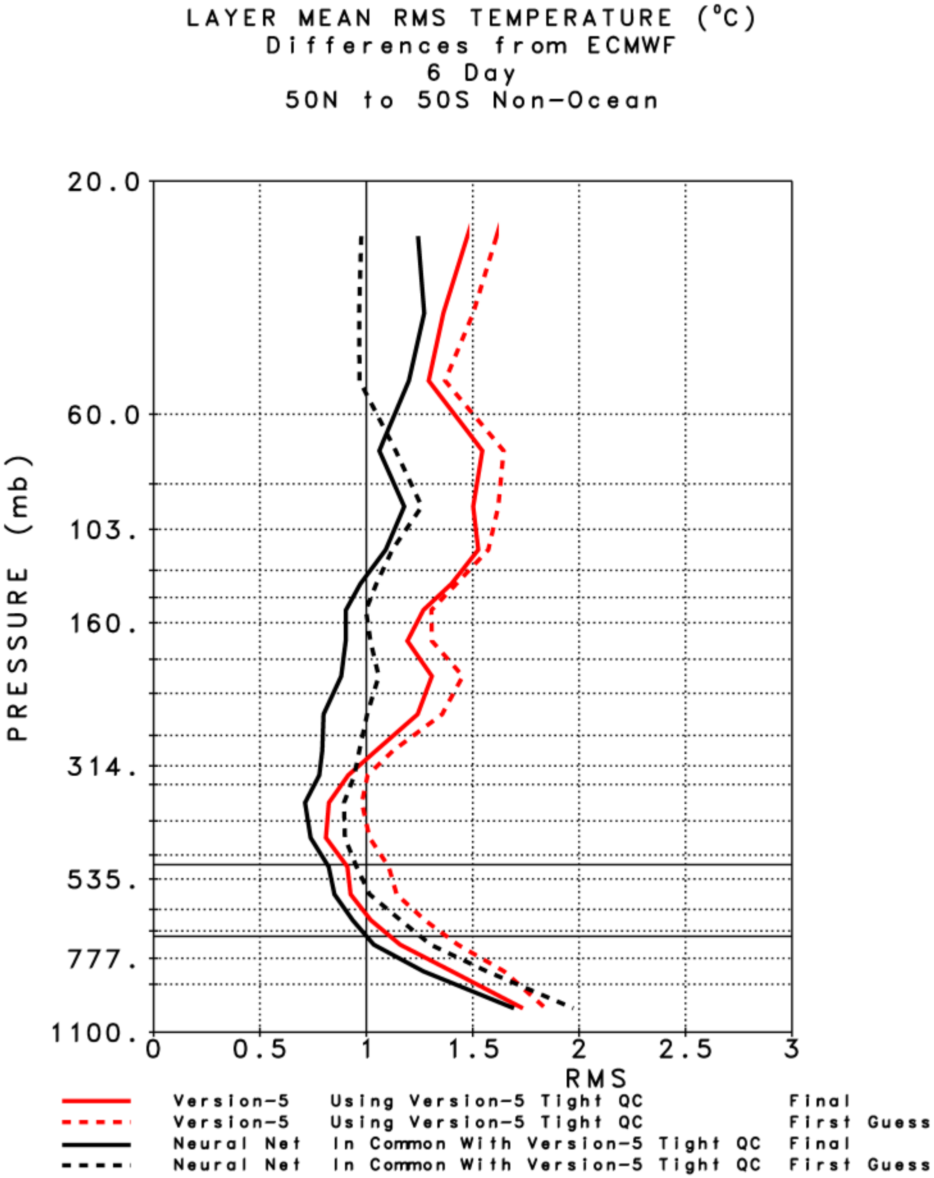
Possible contributions to poorer BLT in Version-6 Neural-Net in North Polar region

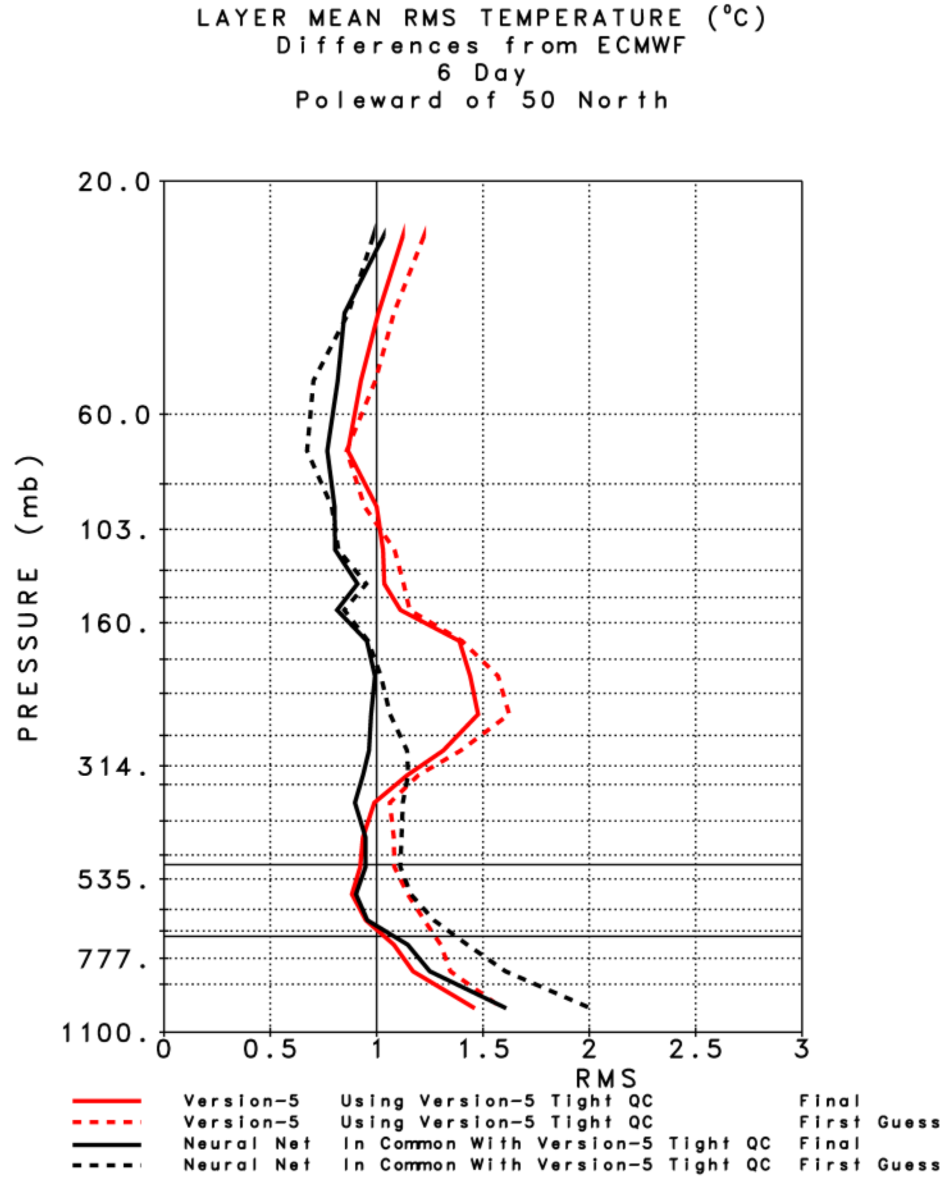
- Effect of differences in initial guess
- Effect of differences in microwave tuning between Version-5 and Version-6 (at JPL)
  - SRT still uses Version-5 microwave tuning
- Effect of differences in Version-6 retrieval algorithm

Next figures show Neural-Net boundary layer guess is poorer than Version-5 Clear Regression guess, especially poleward of 50˚N



LAYER MEAN RMS TEMPERATURE (°C)
Differences from ECMWF
6 Day
Global
PRESSURE (mb)
20.0
60.0
103.
160.
314.
535.
777.
1100.
0
0.5
1
1.5
2
2.5
3
RMS
Version-5 Using Version-5 Tight QC Final
Version-5 Using Version-5 Tight QC First Guess
Neural Net In Common With Version-5 Tight QC Final
Neural Net In Common With Version-5 Tight QC First Guess


LAYER MEAN RMS TEMPERATURE (°C)
Differences from ECMWF
6 Day
50N to 50S Non-Ocean
PRESSURE (mb)
20.0
60.0
103.
160.
314.
535.
777.
1100.
0
0.5
1
1.5
2
2.5
3
RMS
Version-5 Using Version-5 Tight QC Final
Version-5 Using Version-5 Tight QC First Guess
Neural Net In Common With Version-5 Tight QC Final
Neural Net In Common With Version-5 Tight QC First Guess


LAYER MEAN RMS TEMPERATURE (°C)
Differences from ECMWF
6 Day
Poleward of 50 North
PRESSURE (mb)
20.0
60.0
103.
160.
314.
535.
777.
1100.
0
0.5
1
1.5
2
2.5
3
RMS
Version-5 Using Version-5 Tight QC Final
Version-5 Using Version-5 Tight QC First Guess
Neural Net In Common With Version-5 Tight QC Final
Neural Net In Common With Version-5 Tight QC First Guess

# Comparison of SRT Version-5.44 with JPL 2 Regression MODIS

SRT Version-5.44 should be scientifically equivalent to JPL 2 Regression MODIS except

- SRT Version-5.44 uses old microwave tuning (like Version-5)
- SRT Version-5.44 uses old climatology (like Version-5)
- JPL 2 Regression MODIS is coded differently but meant to be scientifically equivalent

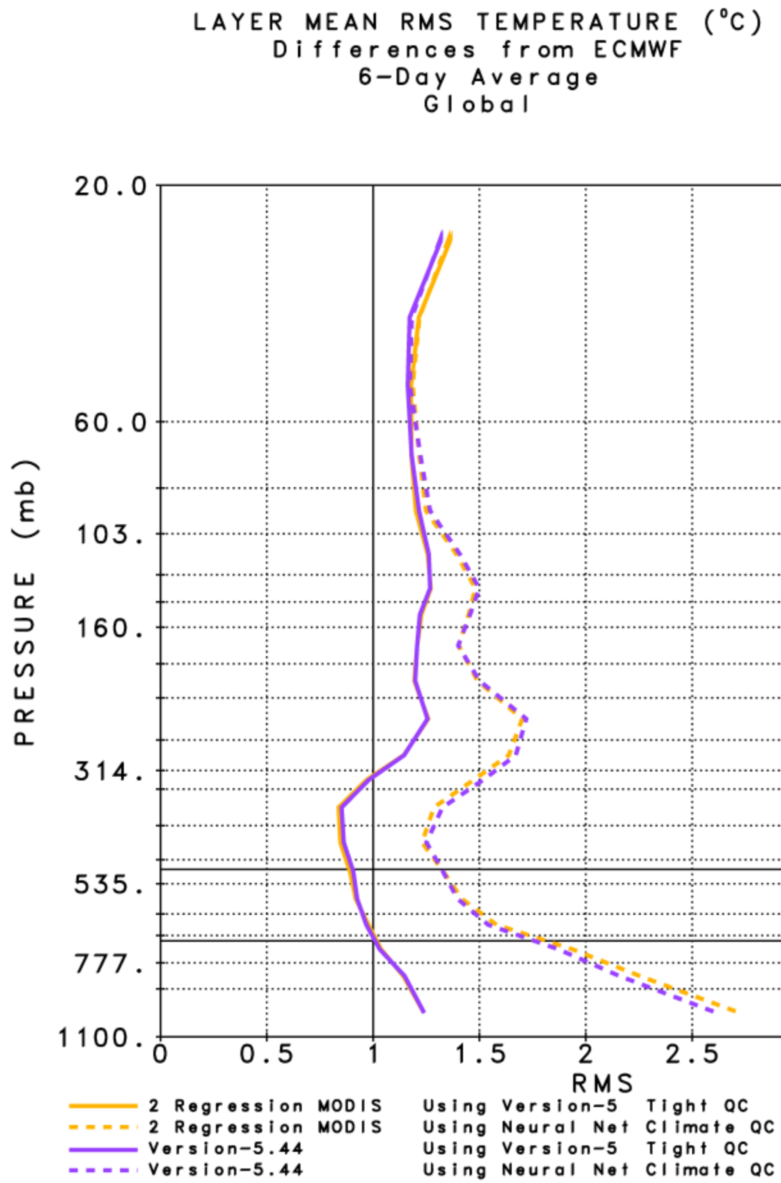
We compare both sets of T(p) retrievals on the easy and hard ensembles

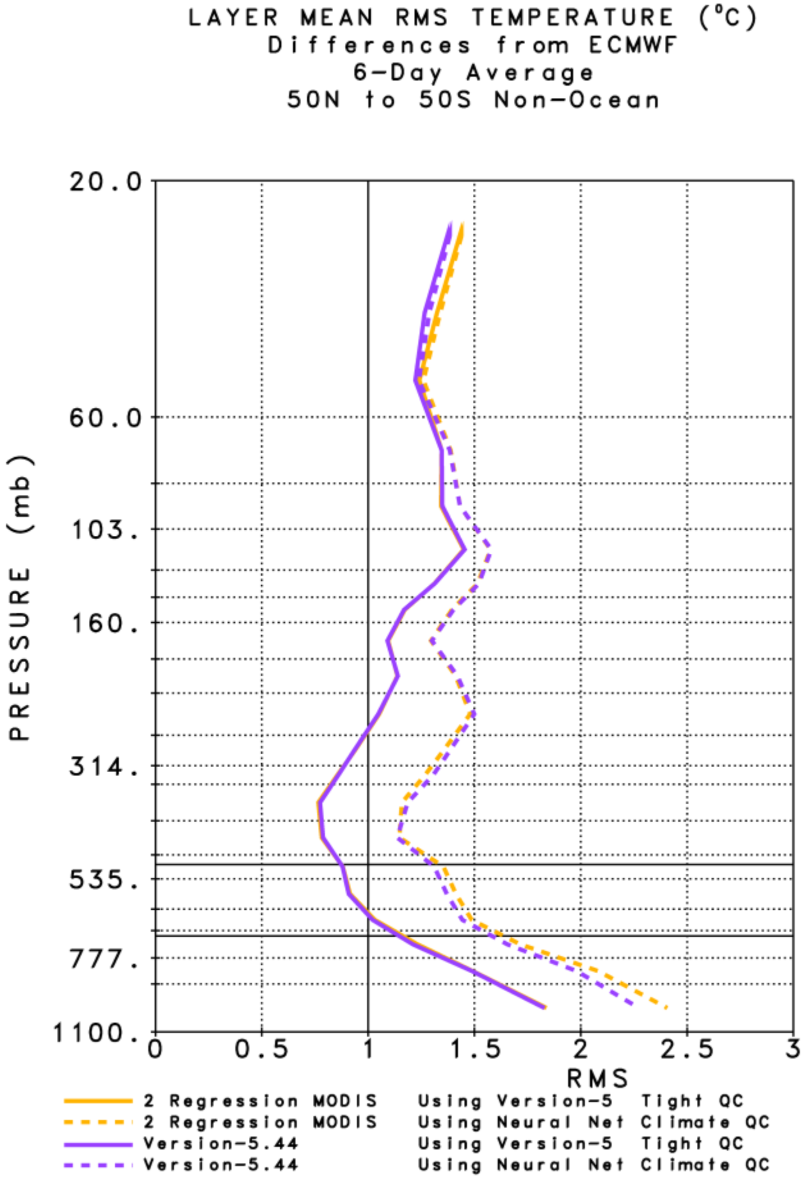
We compare both sets of QC'd SST's

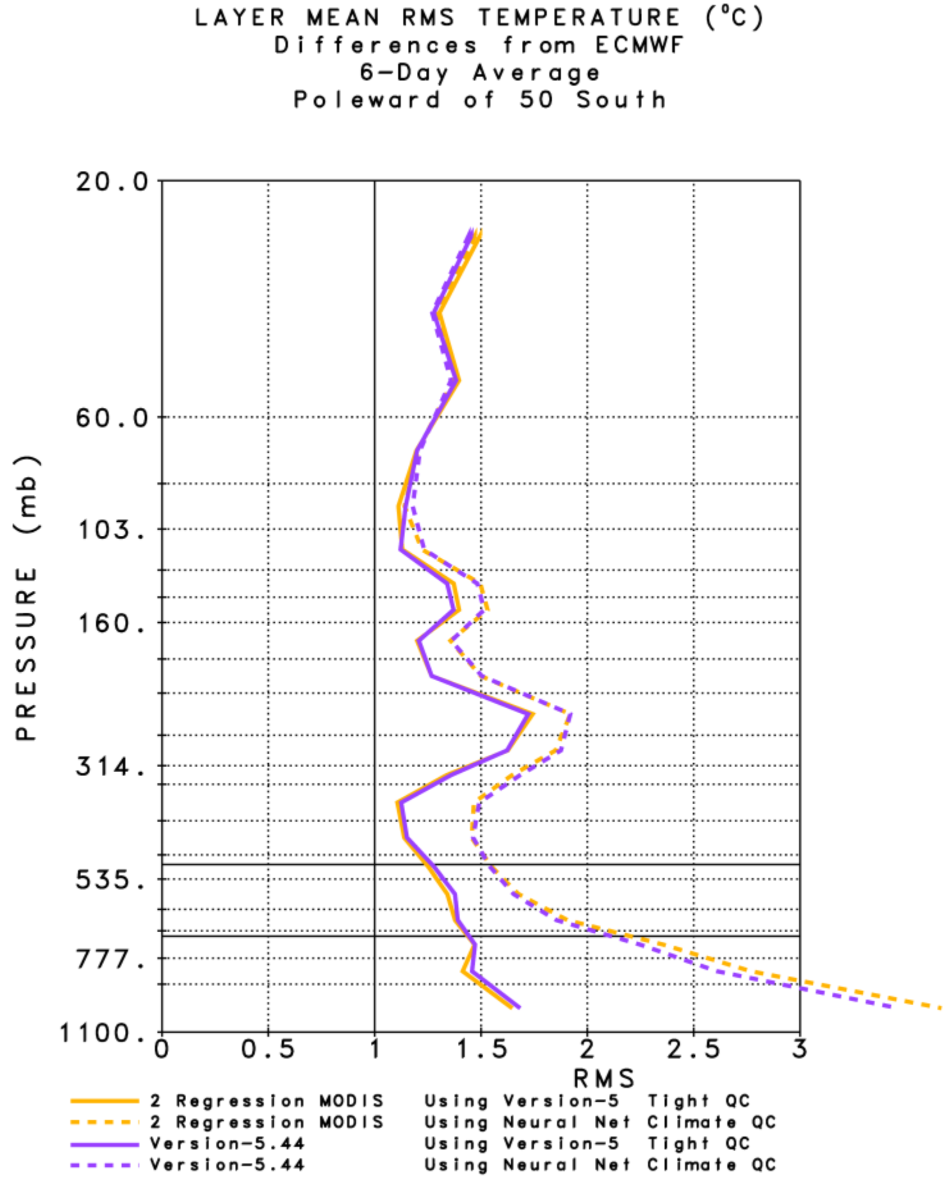
Results show SRT Version-5.44 performs better than JPL 2 Regression MODIS

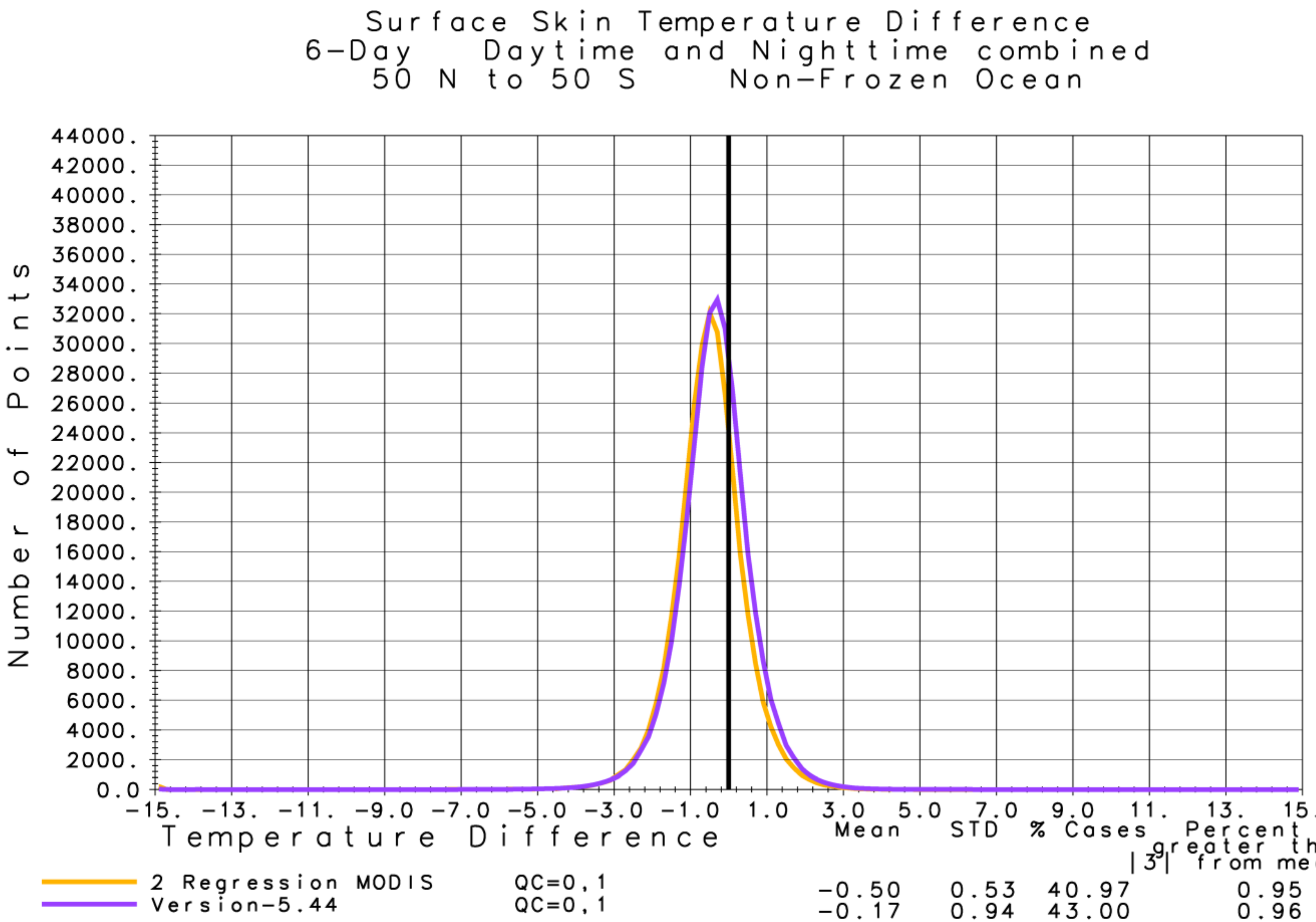
Boundary layer temperature is not as bad for harder cases

Negative SST bias is much less in Version-5.44 than that in JPL 2 Regression MODIS and also in JPL Neural Network


LAYER MEAN RMS TEMPERATURE (°C)
Differences from ECMWF
6-Day Average
Global
PRESSURE (mb)
20.0
60.0
103.
160.
314.
535.
777.
1100.
0
0.5
1
1.5
2
2.5
3
RMS
2 Regression MODIS Using Version-5 Tight QC
2 Regression MODIS Using Neural Net Climate QC
Version-5.44 Using Version-5 Tight QC
Version-5.44 Using Neural Net Climate QC


LAYER MEAN RMS TEMPERATURE (°C)
Differences from ECMWF
6-Day Average
50N to 50S Non-Ocean
PRESSURE (mb)
20.0
60.0
103.
160.
314.
535.
777.
1100.
0
0.5
1
1.5
2
2.5
3
RMS
2 Regression MODIS Using Version-5 Tight QC
2 Regression MODIS Using Neural Net Climate QC
Version-5.44 Using Version-5 Tight QC
Version-5.44 Using Neural Net Climate QC


LAYER MEAN RMS TEMPERATURE (°C)
Differences from ECMWF
6-Day Average
Poleward of 50 South
PRESSURE (mb)
20.0
60.0
103.
160.
314.
535.
777.
1100.
0
0.5
1
1.5
2
2.5
3
RMS
2 Regression MODIS Using Version-5 Tight QC
2 Regression MODIS Using Neural Net Climate QC
Version-5.44 Using Version-5 Tight QC
Version-5.44 Using Neural Net Climate QC




| Mean | STD | % Cases \|3\| | Percent greater than from mean |
|---|---|---|---|
| -0.50 | 0.53 | 40.97 | 0.95 |
| -0.17 | 0.94 | 43.00 | 0.96 |

# Recent Changes to Cloud Parameter Retrieval Algorithm

Experiments conducted were inspired by interaction with Van Dang and Evan Manning

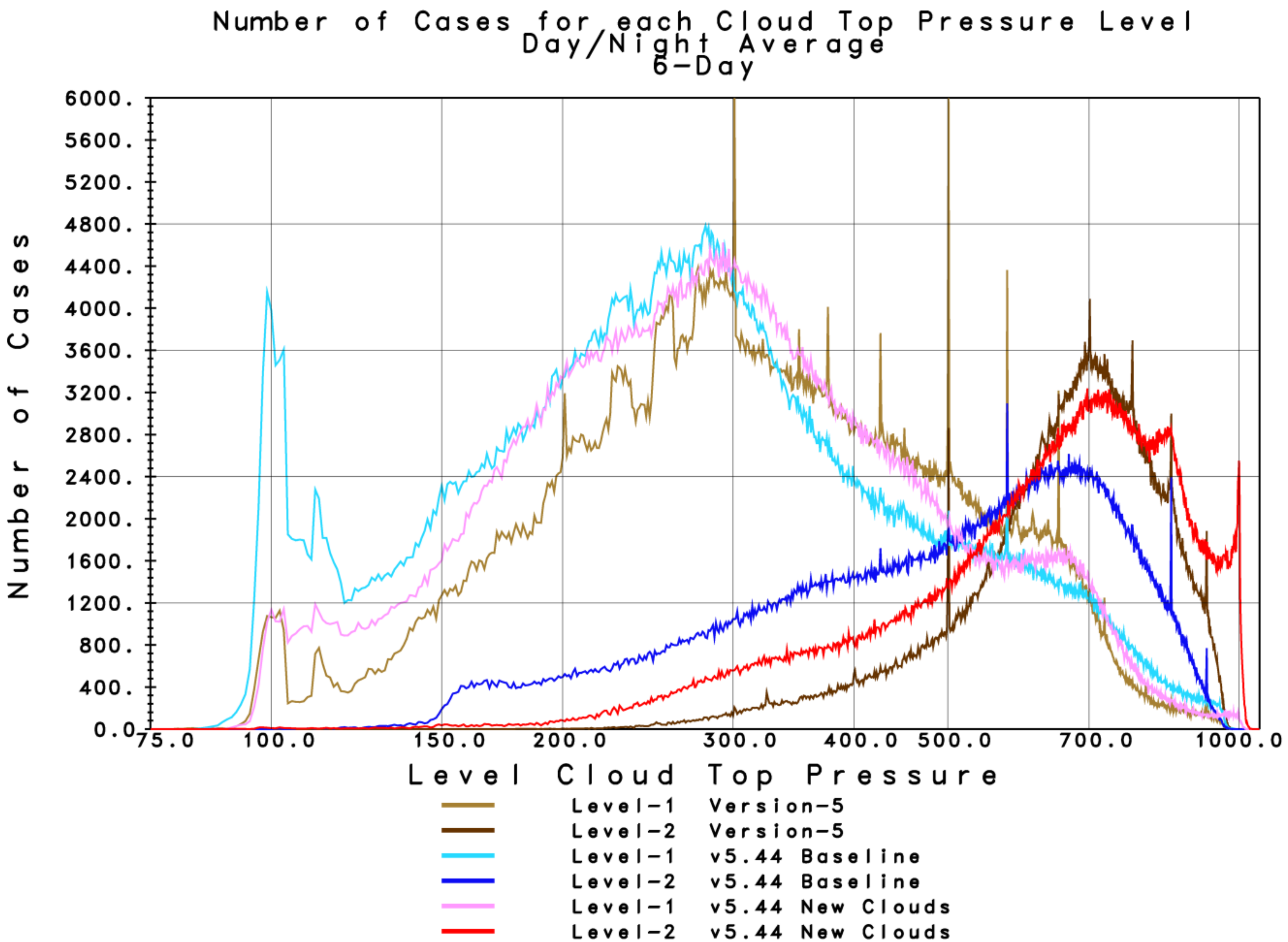
Experiments were conducted using SRT Version-5.44

Version 5.44 “baseline” performs cloud retrieval exactly as done in JPL Version-5.7.4

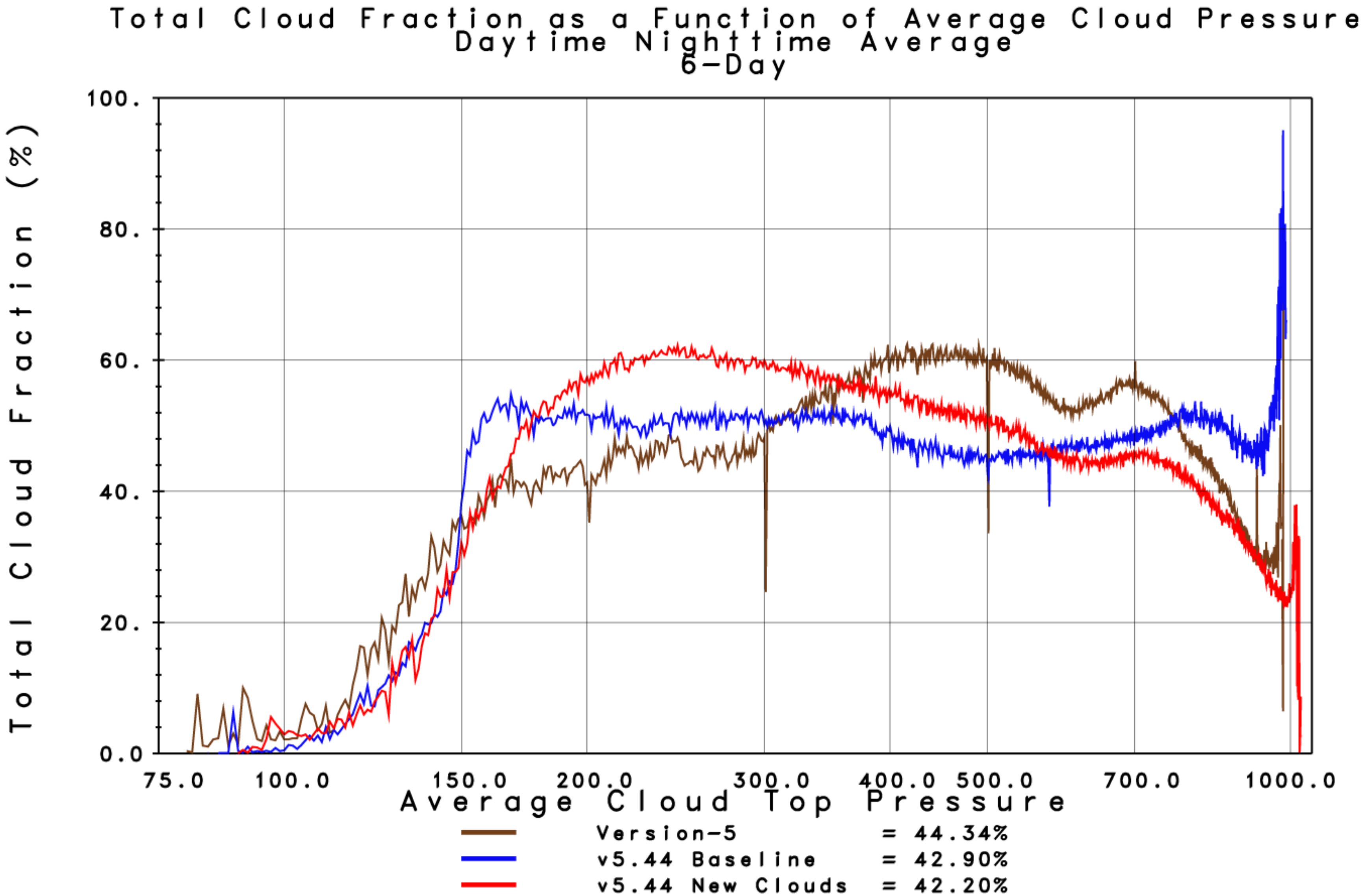
Version 5.44 “new clouds” has 4 changes

- More damping in the cloud parameter retrieval step
- Two code changes dealing with treatment of clouds near the surface
- A code change dealing with first pass cloud retrievals contain only 1 layer

Results shown are preliminary – this is a work in progress



Number of Cases for each Cloud Top Pressure Level
Day/Night Average
6-Day
Number of Cases
6000.
5600.
5200.
4800.
4400.
4000.
3600.
3200.
2800.
2400.
2000.
1600.
1200.
800.
400.
0.0
75.0
100.0
150.0
200.0
300.0
400.0
500.0
700.0
1000.0
Level Cloud Top Pressure
Level-1 Version-5
Level-2 Version-5
Level-1 v5.44 Baseline
Level-2 v5.44 Baseline
Level-1 v5.44 New Clouds
Level-2 v5.44 New Clouds


Total Cloud Fraction as a Function of Average Cloud Pressure
Daytime Nighttime Average
6-Day
Total Cloud Fraction (%)
100.
80.
60.
40.
20.
0.0
75.0
100.0
150.0
200.0
300.0
400.0
500.0
700.0
1000.0
Average Cloud Top Pressure
Version-5 = 44.34%
v5.44 Baseline = 42.90%
v5.44 New Clouds = 42.20%

# Preliminary Findings

Compared to Version-5.44 baseline the new cloud retrieval step has

- Significantly reduced the number of cases with high clouds higher than 120 mb

  This is closer to Version-5

- Significantly increased the number of cases with low clouds lower than 700 mb

  This is closer to Version-5

- Decreased cloud fraction (level 1 plus level 2) between 150 mb and 170 mb as well as lower than 700 mb – This is closer to Version-5
- Increased cloud fraction between 170 mb and 550 mb

These all seem like good things

New cloud retrieval steps removed all spikes in the cloud distribution as a function of pressure

This is definitely a good thing

# Required Further Work Before Release of Version-6

- Code at JPL must be modified to generate error estimates for SCCNN and SCCNN AO

  Also needs new tables of coefficients and thresholds (John Blaisdell)

- New QC thresholds for constituent profiles, total precipitable water, and Clear Sky OLR generated using JPL SCCNN and SCCNN AO runs (Lena Iredell)

- Optimization of QC for $CO_2$ retrievals using Neural-Net Start-up (Ed Olsen, Joel Susskind, …..)

  We must have a satisfactory $CO_2$ product as part of Version-6

- Modifications to Level 3 code at JPL

  Products in each AIRS FOV should be gridded separately

  Coastal cases (part land, part ocean) should be included in the gridding

  Addition of new parameters to level 3 support product

# Desired Further Work Before Release of Version-6

**SRT**

Bring up Neural-Net retrieval system (1 month)

Conduct retrieval optimization studies using Neural-Net system (1-2 months)

Channel selection and damping parameters for T(p), q(p), skin temperature and surface emissivity, cloud clearing and cloud parameters

Compare results using new and old MW tuning

**CO retrievals –** Juying Warner and Eric Maddy

Install climatology first guess for CO retrieval

Further study with regard to angle dependence of CO retrievals

I think new CO RTA needs an empirical correction at large angles

We might need 3 more months to accomplish the desired research