



*Report on the*

# **JCSDA Microwave Sensors Working Group**

*Co-Chairs: Fuzhong Weng (NOAA/NESDIS) and Steve Swadley (NRL)*

*JCSDA 8<sup>th</sup> Science Workshop, UMBC, May 4-5, 2010*



# FY2009 Highlights

- Extend MWG Membership
- Microwave Sensor Performance Monitoring
- New Microwave Dataset Release
- Adjoint Sensitivity Studies
- OSE/OSSE MW Sensor Studies



# MWG Team Members

The goal is to have representatives from all JCSDA partners with expertise in both microwave sensor hardware and data assimilation

## JCSDA Microwave Sounder Working Group

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# Instrument Performance and Bias Monitoring Systems

- Assist in NWP community to diagnose major forecast busts and drop-outs related to satellite data
  - Correlation of NWP bias monitoring/data utilization rate with  $NE\Delta T$
- Provide real-time diagnose and root-cause analysis for any major instrument anomaly, i.e.,
  - NOAA-18 HIRS filter wheel loose lens
  - NOAA-19 MHS Ch 3 and 4 front end associated with RF/IF
- Build a climate quality data base for CDR reprocessing
  - Noise spikes and anomaly events associated with SDR data
  - Retrospective check of historic sensor data
  - Incorporate upgrades to Ground Processing Software
  - Reprocess SDR data as needed



# STAR Integrated Cal/Val System: Online Capability

STAR - Satellite Integrated Calibration / Validation System (ICVS) - NOAA-19 Instrument Monitoring - AMSU-A - Mozilla ...

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http://www.star.nesdis.noaa.gov/smcd/spb/icvs/satMonitoring\_n19\_amax.php

Enter search term(s)

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»Integrated Cal/Val System

»Satellite Monitoring >>

•NOAA-19 AMSU-A >>

•NOAA-19 MHS

•NOAA-19 AVHRR

•NOAA-19 HIRS

•MetOP-A AMSU-A

•MetOP-A MHS

•NOAA-18 AMSU-A

•NOAA-18 MHS

»Products Demonstration

»Meetings

»Publications

Data and images displayed on STAR sites are provided for experimental use only and are not official operational NOAA products. [More information>>](#)

## Satellite Integrated Calibration / Validation System (ICVS)

### NOAA-19 AMSU-A Instrument Performance Monitoring

Please select the instrument performance index & press 'Display' Button

#### AMSU-A NE $\Delta$ T/Gain

Last Week NE $\Delta$ T Snapshot

#### AMSU-A Instrument Temperature

A1-1 Warm Load

#### AMSU-A Mixer/IF Amplifier Temperature

Last Week Snapshot

#### AMSU-A Local Oscillator Temperature

Last Week Snapshot

#### AMSU-A Cold Calibration Count

Last Week Snapshot

#### AMSU-A Warm Calibration Count

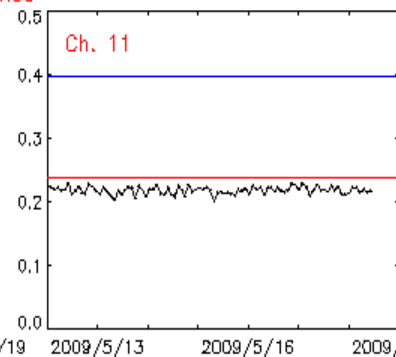
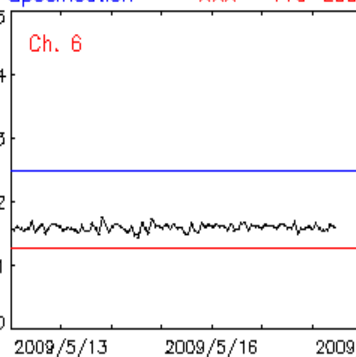
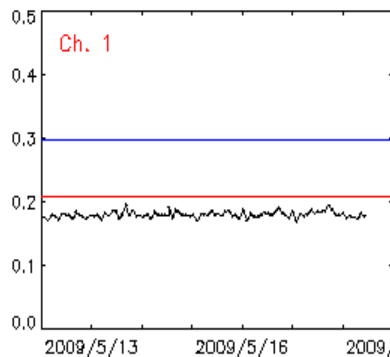
Last Week Snapshot

#### AMSU-A Status

Last Week Orbit Status

### NOAA-19 AMSU-A NE $\Delta$ T

\*\*\* = Specification      XXX = Pre-Launched

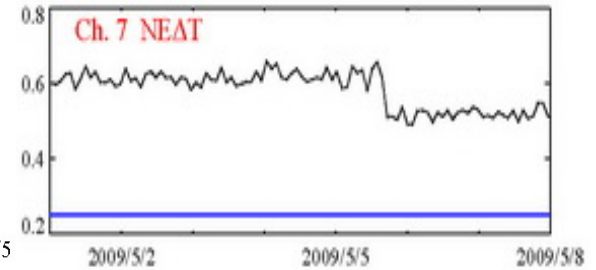
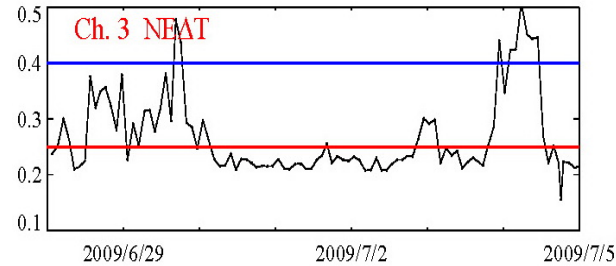




# STAR Integrated Cal/Val System: Monitoring and Trending All POES instruments

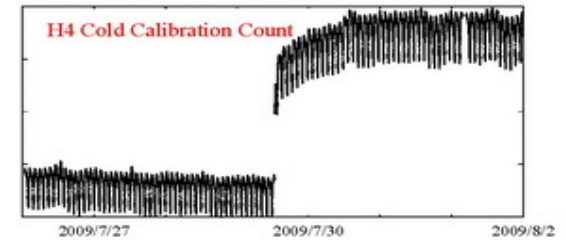
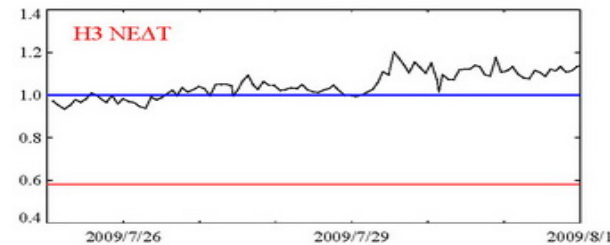
## AMSU-A

- NOAA-19 Ch3 NE $\Delta$ T anomaly
- MetOP-A Ch7 NE $\Delta$ T Drop



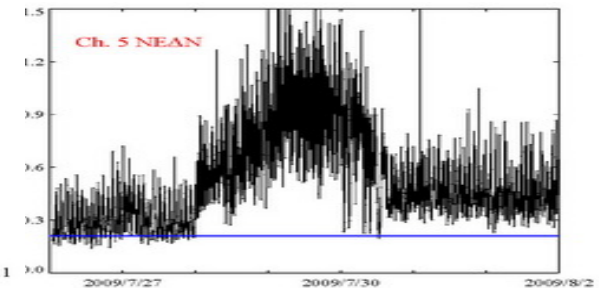
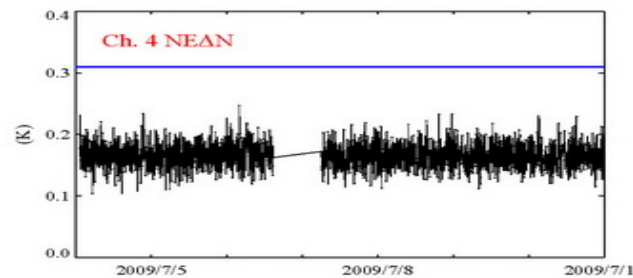
## MHS

- NOAA-19 H3 NE $\Delta$ T is out of specification (1K)
- NOAA-19 H4 Cold Calibration Count jump



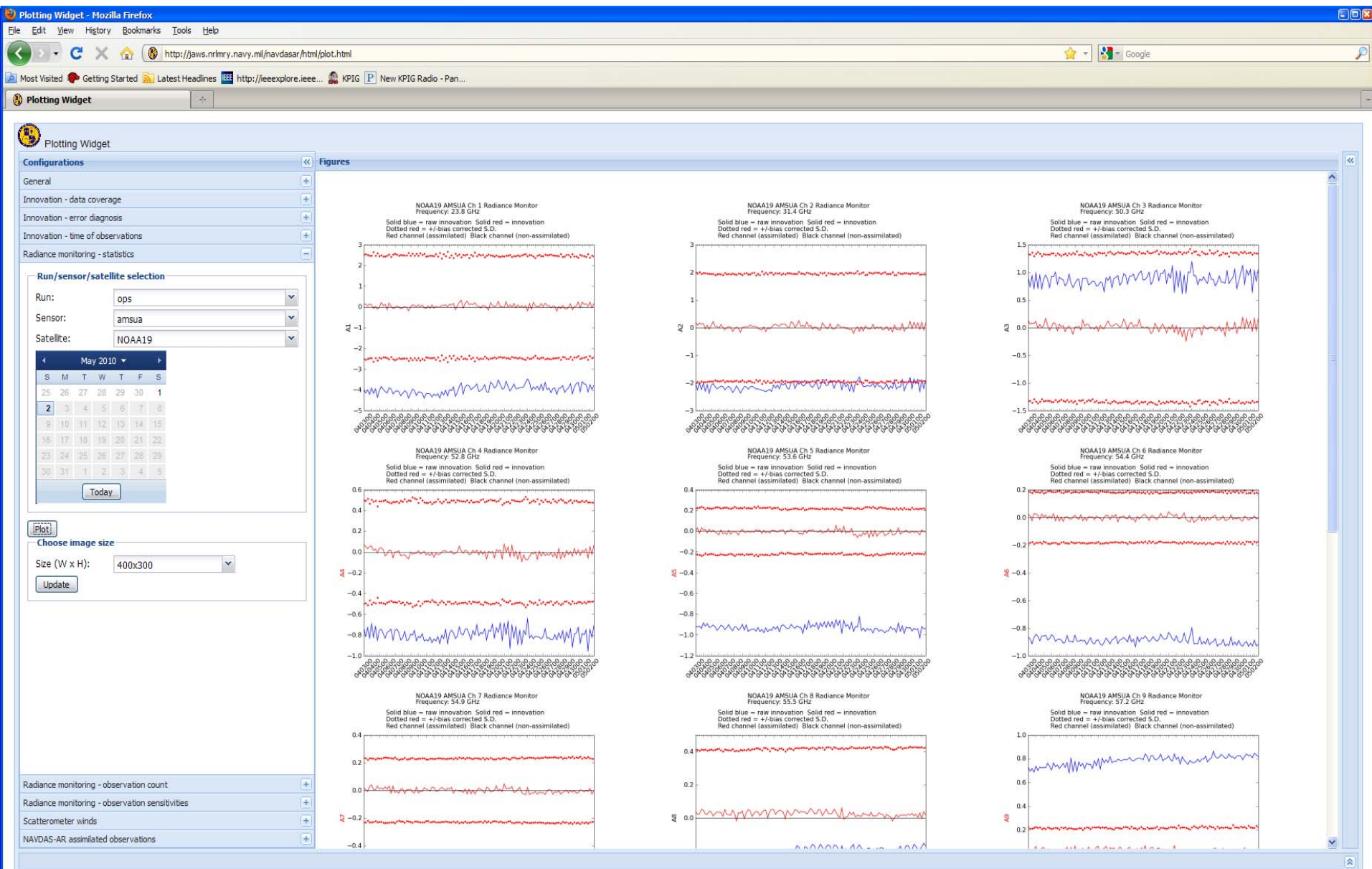
## HIRS

- NOAA-19 Ch4 Data Gaps
- NOAA-18 Ch5 NE $\Delta$ N Anomaly





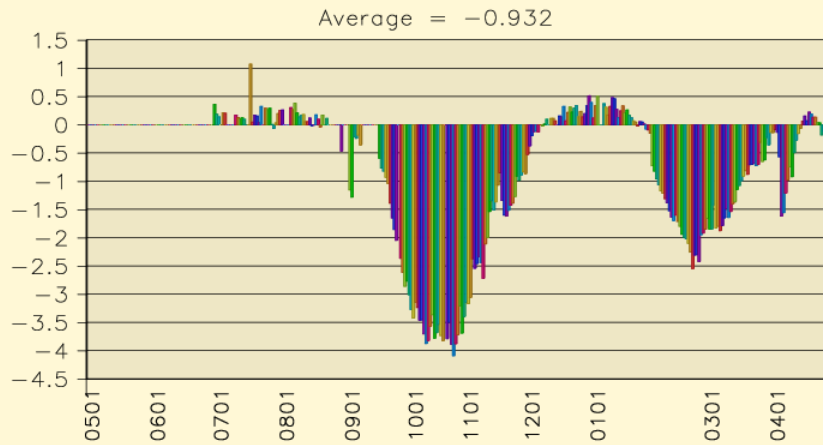
# NRL Online Monitoring



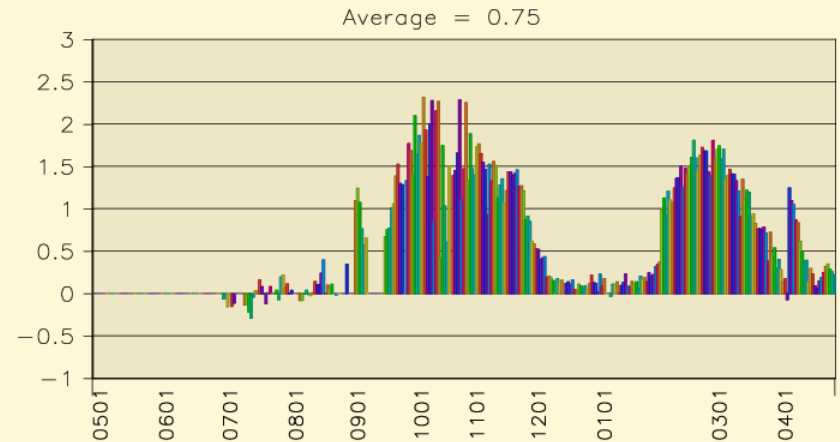


# NRL Online Monitoring

Global F15 SSM/I Mean Wind Speed INNOV [m/s]  
1-year ending 28 APR 2010



Global Mean TPW INNOV [mm]  
F15 SSM/I Sfc-10 hPa  
1-year ending 27 APR 2010



Long term monitoring of the F15 SSM/I depicts RADCAL Beacon's Interference with T22V and the resulting effect on the Ocean Windspeed and Total Water Vapor EDRs. T22V increased 15-20 K during RADCAL Transmit periods





# ECMWF Online Monitoring

Time series of area averages - Mozilla Firefox

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http://www.ecmwf.int/products/forecasts/d/charts/monitoring/satellite/atovs/amsua/o\_noaa\_ Google

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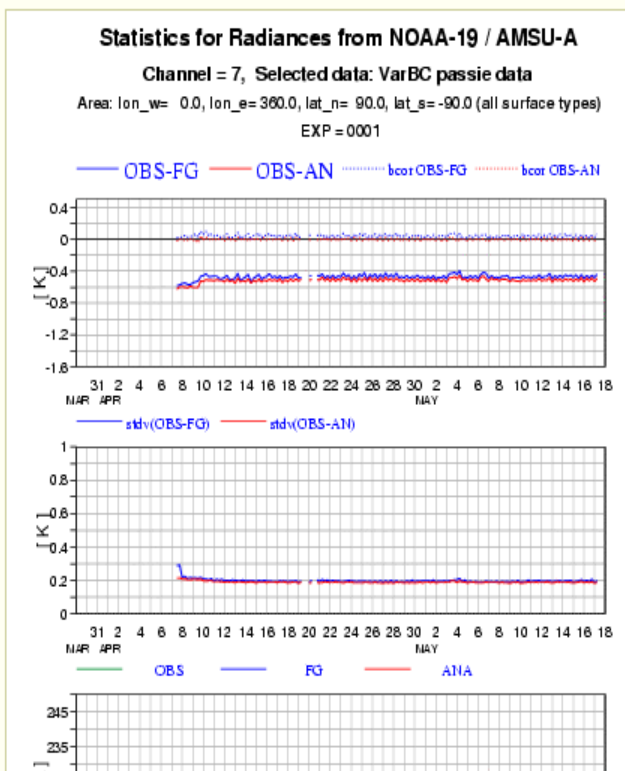
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## Time series of area averages

- Satellite
- METOP-A
  - NOAA-15
  - NOAA-16
  - NOAA-18
  - NOAA-19
  - AQUA

- Channel
- 1
  - 2
  - 3
  - 4
  - 5
  - 6
  - 7
  - 8
  - 9
  - 10
  - 11
  - 12
  - 13
  - 14
  - 15





# MW Sensor Anomaly Reports

- NOAA-18
  - AMSU-A/MHS are all working fine
- NOAA-19
  - AMSU-A Channel 8 NEDT = 0.75K (Spec = 0.25K)
  - MHS Channel 3 NEDT = 3.00K (Spec=1.0K)
- MetOP-A
  - AMSU-A Channel 7 NEDT = 80-120K (Spec=0.25K)



# SSMIS Calibration Anomaly Mitigation

## *Unified Pre-Processor*



NRL and UK Met Office designed, developed and implemented a **Unified Pre-Processor (UPP)** to correct the F16 calibration anomalies

**UPP SSMIS** provides radiances of sufficient quality for **NWP** assimilation

**SSMIS** now plays larger role in the **NPOESS** gap mitigation



Contributors:

**Steve Swadley** (NRL) and **William Bell** (Met Office), Gene Poe, Nancy Baker and Ben Ruston (NRL), Dave Kunkee, Ye Hong, Mike Werner and Don Boucher (Aerospace), Sana Mahmood (Met Office), Yiping Wang, Randy Pauley and Jeff Tesmer (FNMOC), Karl Hoppel (NRL DC), Yong Han (JCSDA), **Shannon Brown** and **Ezra Long** (NASA JPL), **Aluizio Prata** (USC), and **ECMWF**



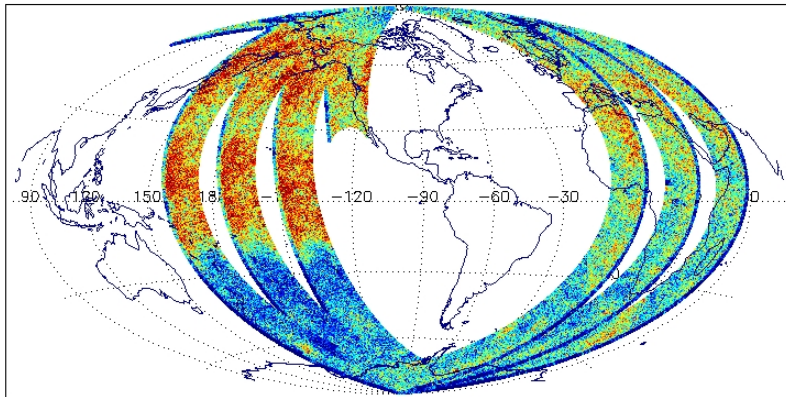
# DMSP SSMIS UPP Update

F16 - Jul 2008, F17 - Apr 2009, F18 - Apr 2010

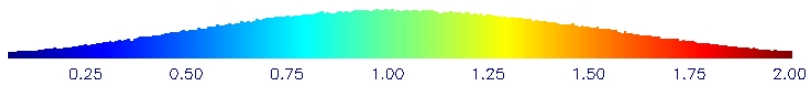


F-16 SSMIS OB-BK ECMWF RTTOV-8 Ch. 4 54.4 GHz V  
DTG: 2010041006  
33415-33417

No. Scenes: 620458  
Min -5.99  
Max 3.25  
MEAN 1.06  
SDEV 0.49

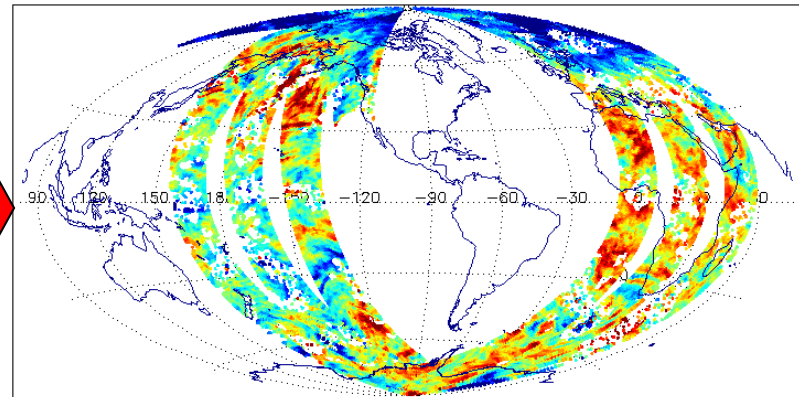


Before



F-16 SSMIS UPP ECMWF OB-BK Ch. 4 54.4 GHz V  
DTG: 2010041006  
Rev Nos.: 33415-33417 Rain Flagged

No. Scenes: 36882  
Min -1.27  
Max 0.70  
MEAN -0.16  
SDEV 0.22



After



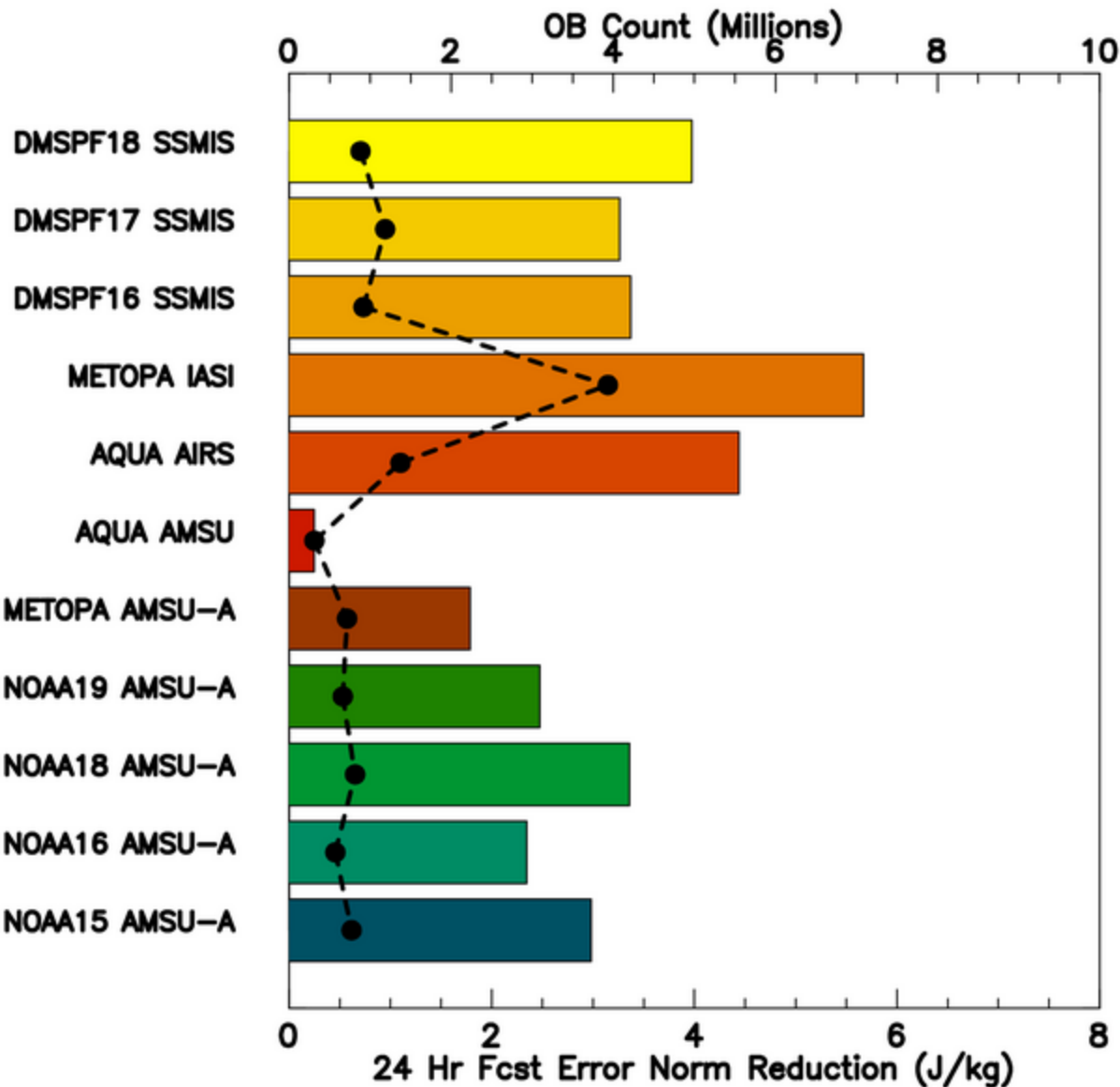
## UPP V2 includes

- Reflector Emission Corrections (F16 and F17)
- Spatial Averaging to reduce  $NE\Delta T$  to 0.15 - 0.25 K level (NRL only)
- Uses Operational NGES Fourier Filtered Gain Files to Correct Gain Anomalies
- Produces ASCII and BUFR TDR output files at full and/or filtered resolution
- Performs Scan Non-uniformity corrections
- SSMIS UPP V2 Operational at FNMOC
- FNMOC distributes UPP data to NESDIS for use by the NWP Community



# F18 SSMIS UPP Data Operational in NOGAPS/NAVDAS-AR at FNMOG

## OPS AR Apr 21 Apr 28

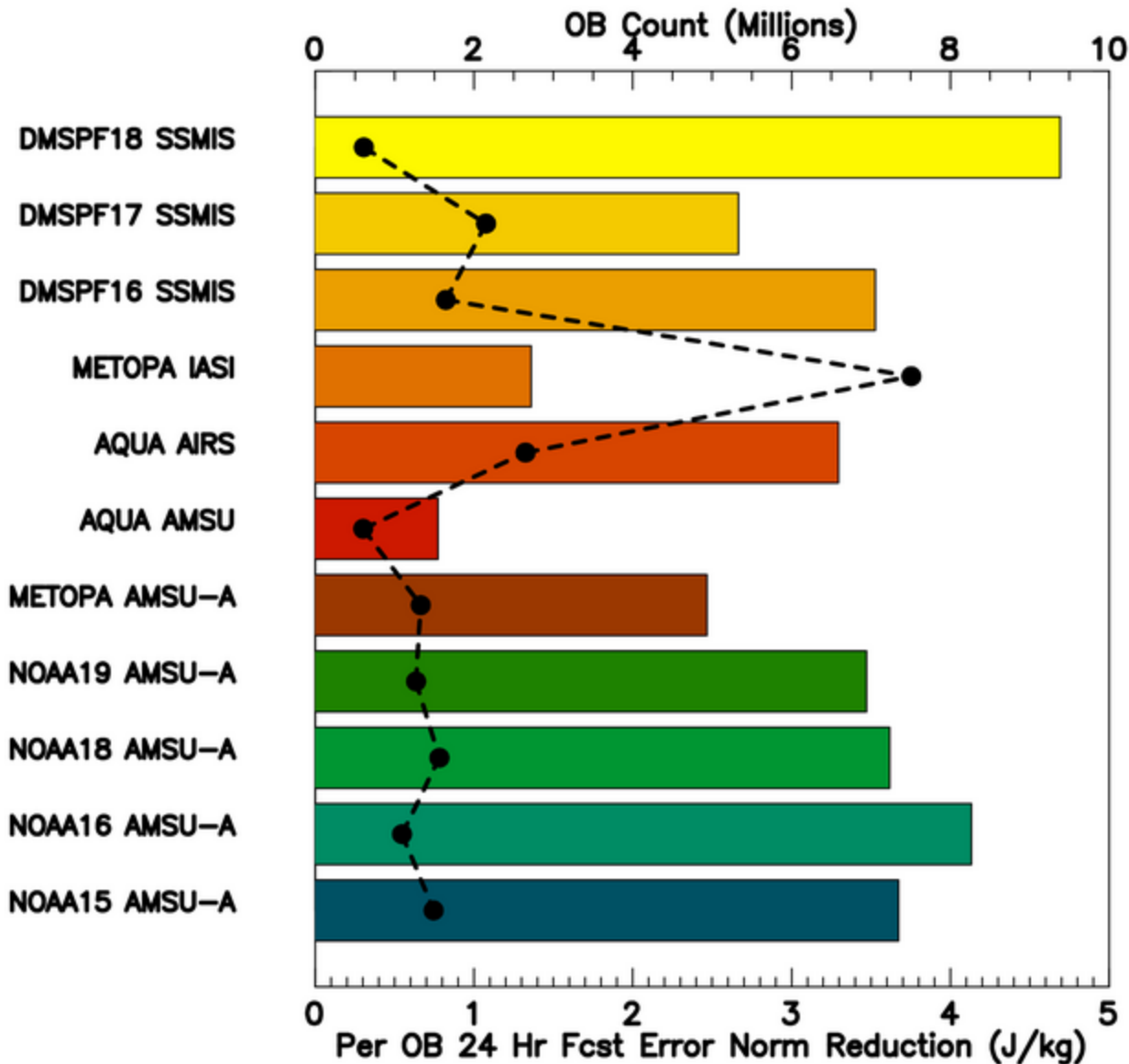


OB Impact Sums



# F18 SSMIS UPP Data Operational in NOGAPS/NAVDAS-AR at FNMOC

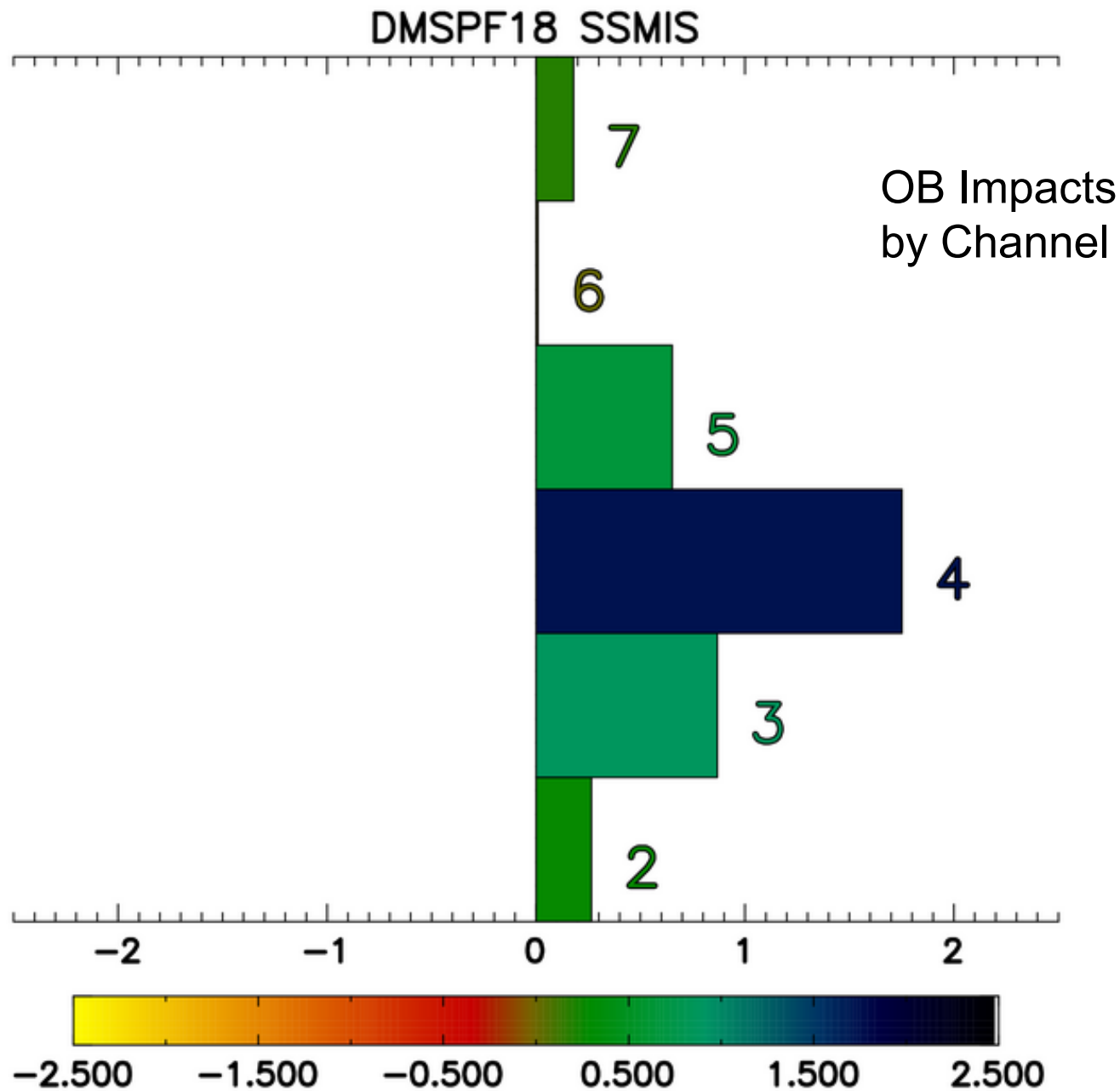
## OPS AR Apr 14 Apr 25



Per OB Impacts

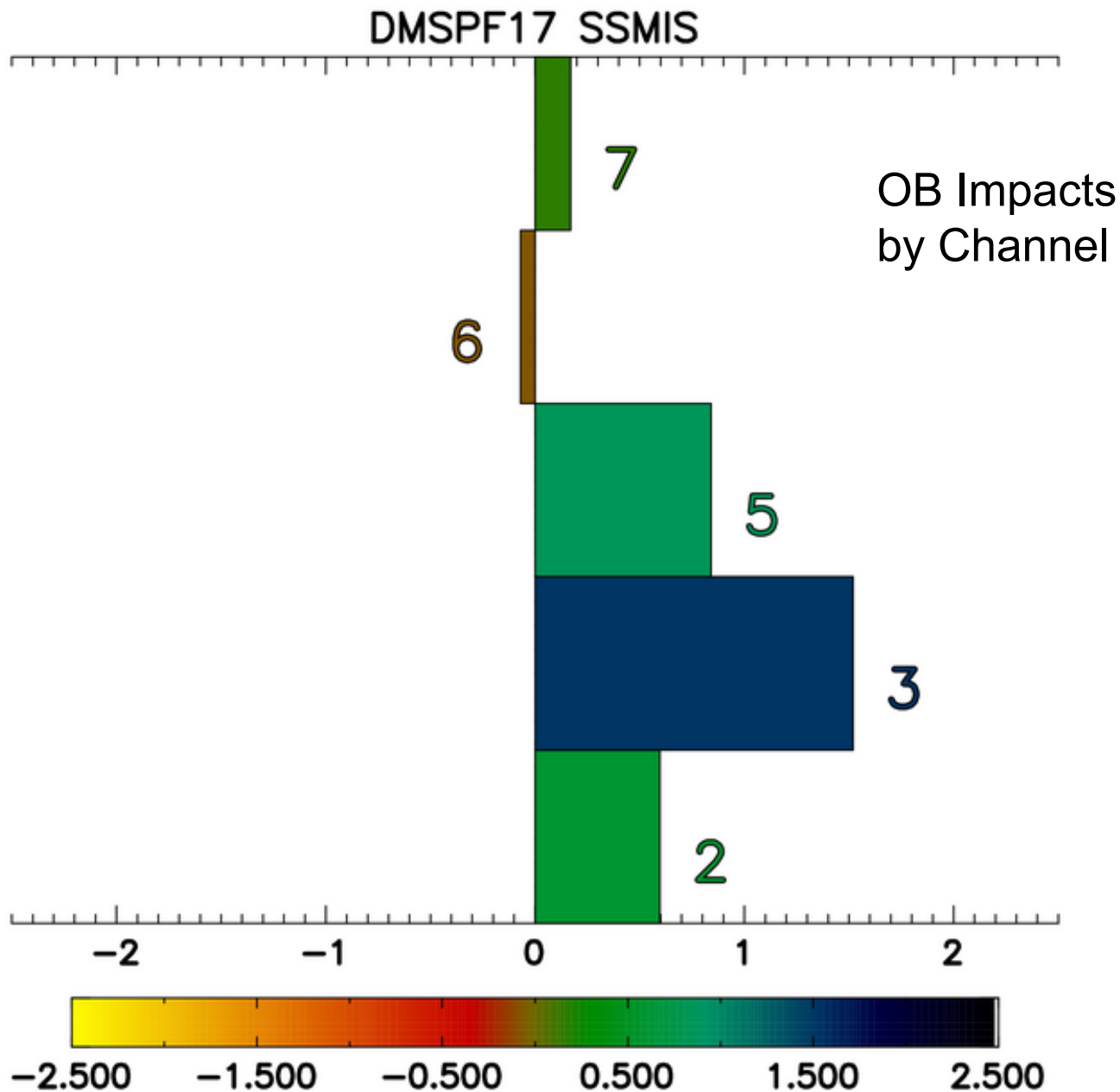


# F18 SSMIS UPP Data Operational in NOGAPS/NAVDAS-AR at FNMOC





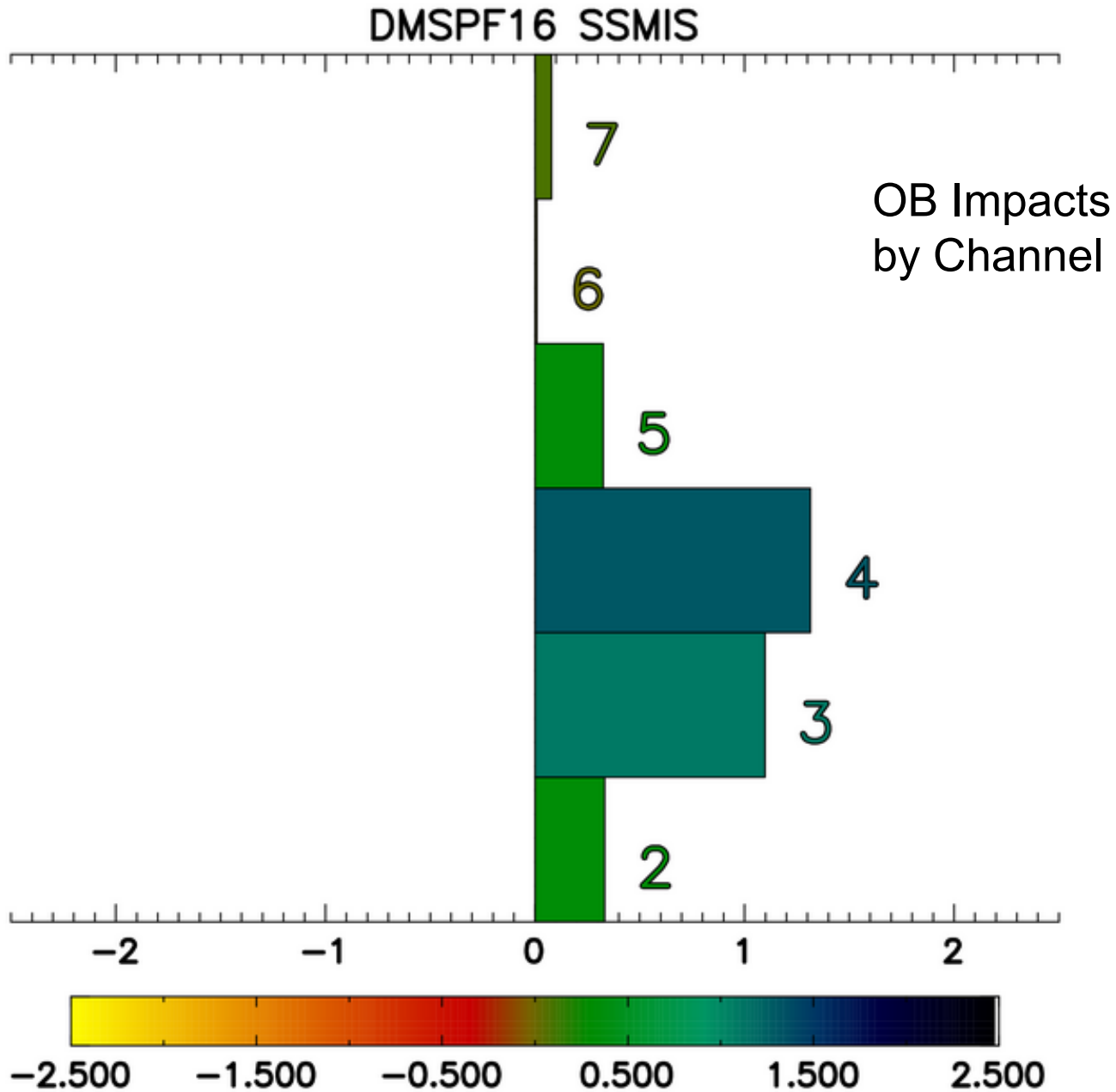
# F17 SSMIS UPP Data Operational in NOGAPS/NAVDAS-AR at FNMOC







# F16 SSMIS UPP Data Operational in NOGAPS/NAVDAS-AR at FNMOC





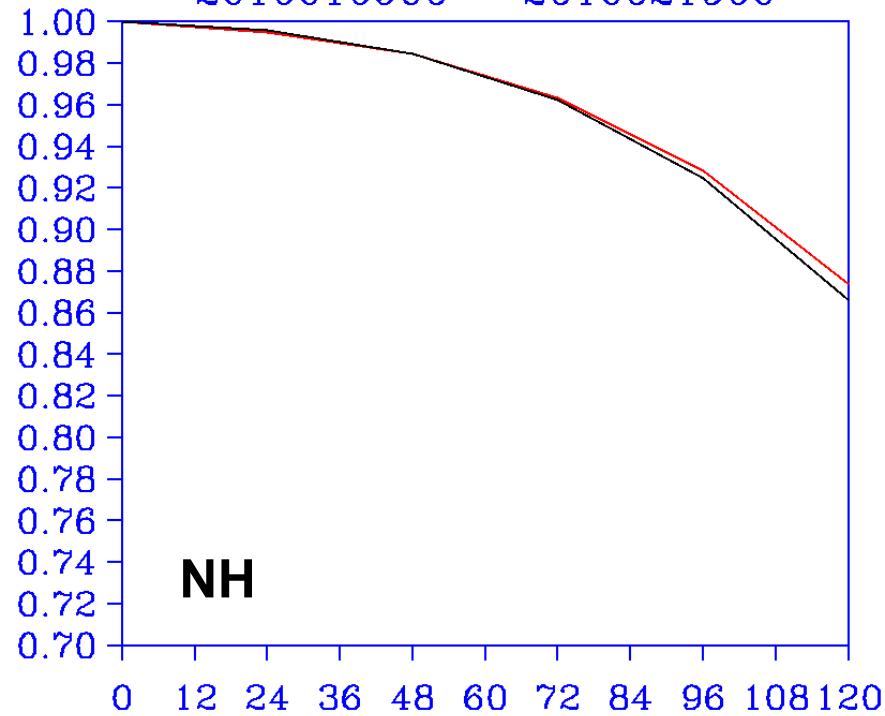
# F-18 SSMIS LAS Assimilation Results

## Assimilation Trials: 09 Jan – 19 Feb 2010



NOGAPS DATA ASSIMILATION TEST

500 MB NORTH HEM HEIGHT ANOMALY COR  
2010010900 – 2010021900

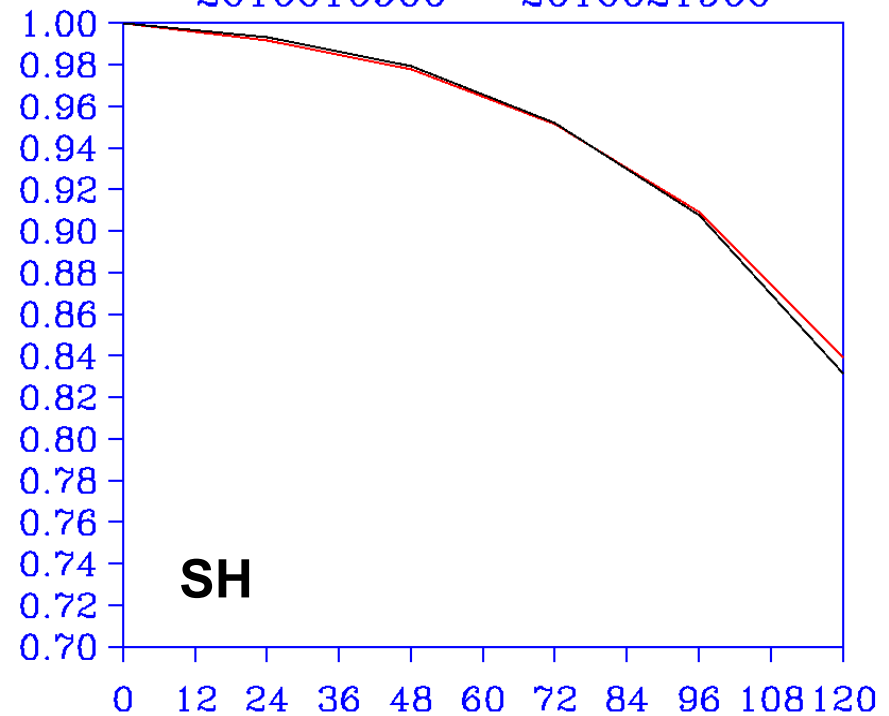


— F18

— OPS

NOGAPS DATA ASSIMILATION TEST

500 MB SOUTH HEM HEIGHT ANOMALY COR  
2010010900 – 2010021900



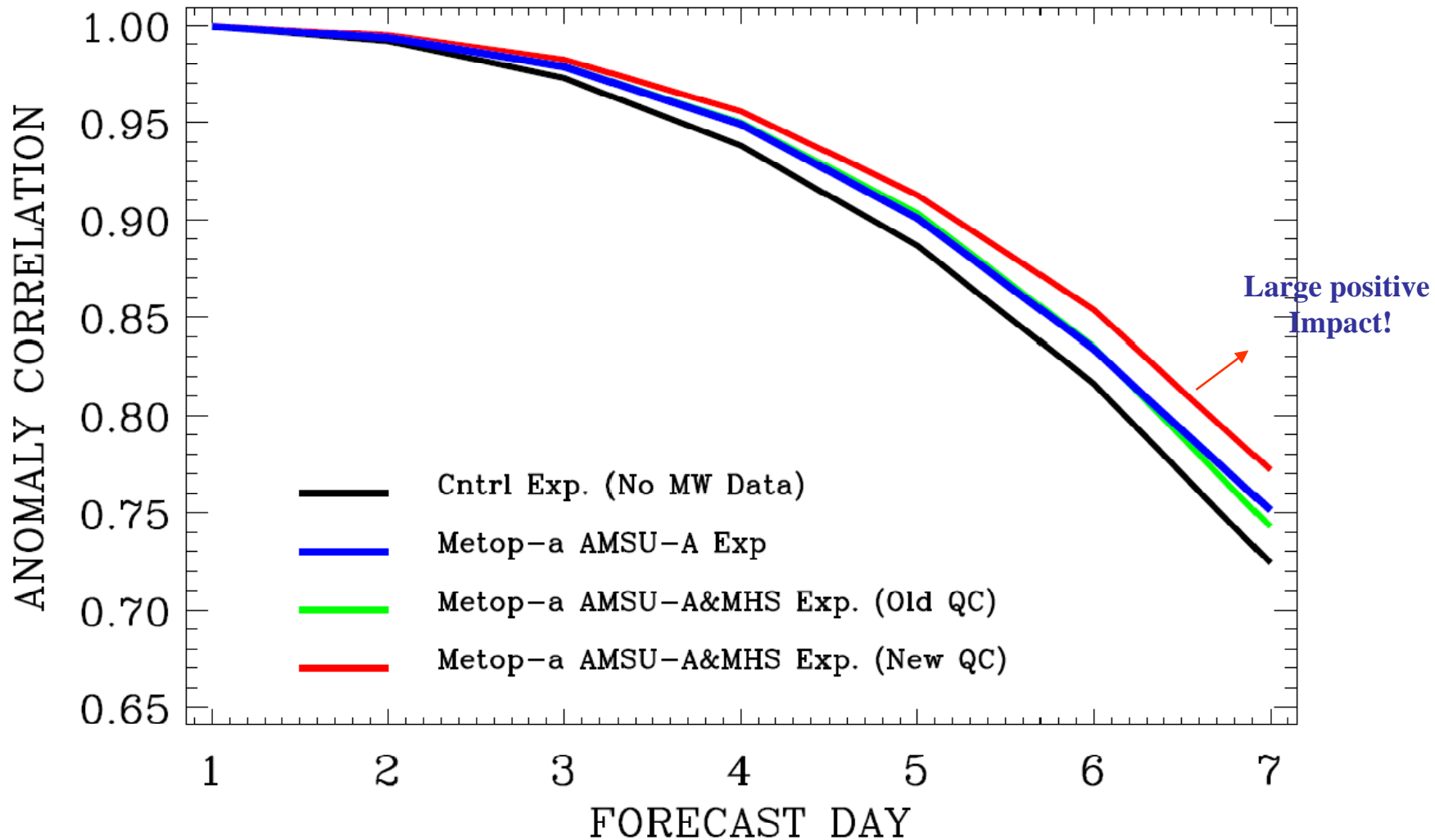
— F18

— OPS



# Impacts of METOP-A MHS Data (New/Old QCs)

## Southern Hemisphere 500mb Height





# Microwave Working Group Home Page

Login required: <https://cs.star.nesdis.noaa.gov/twiki/bin/view/JCSDA/JCSDAMicrowaveSounderProjectTeam>



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## Welcome to the home page for the JCSDA Microwave Working Group !

This twiki topic has been created for use by and reference for team members.

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- **Page access or user permissions**, please contact Lori Brown at [lori.brown@noaaNOSPAM.gov](mailto:lori.brown@noaaNOSPAM.gov).

### Team Meeting Summaries

- [JCSDA\\_Microwave\\_WG\\_6\\_Mar\\_09\\_Meeting\\_Summary.doc](#): March 6 Meeting Summary
- [MWSWGSummary\\_020609\\_Draft.doc](#): Microwave Working Group Summary - February 6, 2009

### Presentations

Twiki – platform