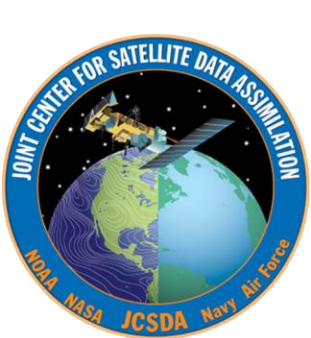


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# Use Of NPP and FY-3 Data In The Joint Center For Satellite Data Assimilation

Lars Peter Riishojgaard  
Director, JCSDA

Chair, OPAG-IOS, WMO Commission for Basic Systems

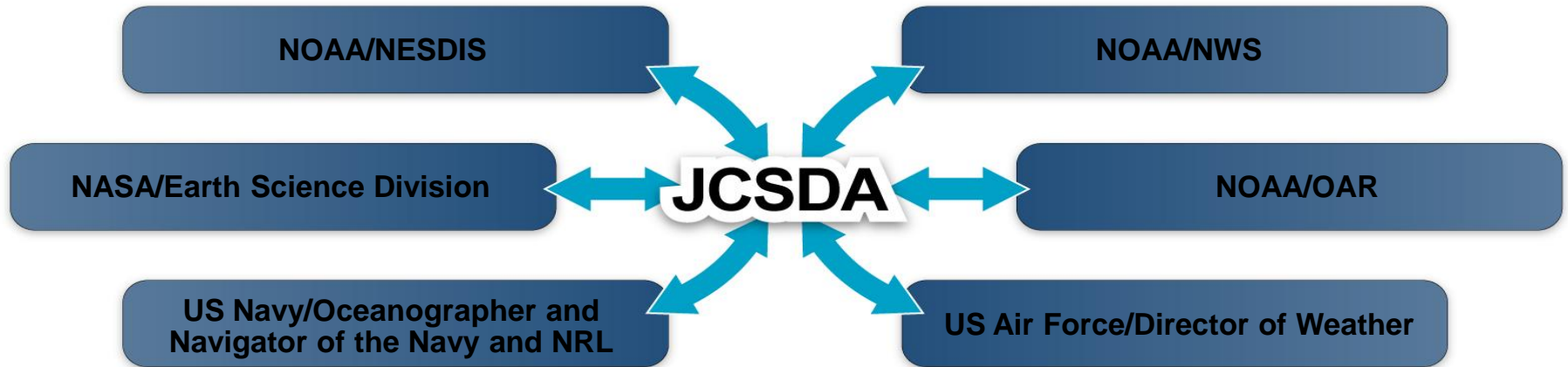


# Overview

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- Research to Operations – an introduction to JCSDA
- Weather prediction and satellite data
  - Motivation for R2O, NPP, FY-3
- NPP-related activities
- FY-3 plans
- Summary
- Two announcements

# JCSDA Partners, Vision, Mission



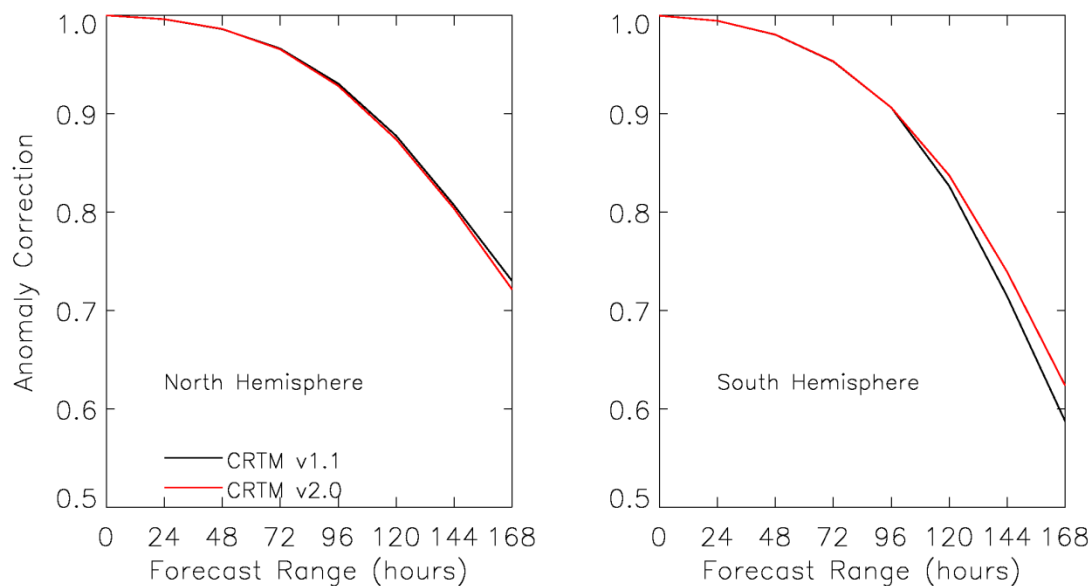
## **Vision:**

*An interagency partnership working to become a world leader in applying satellite data and research to operational goals in environmental analysis and prediction*

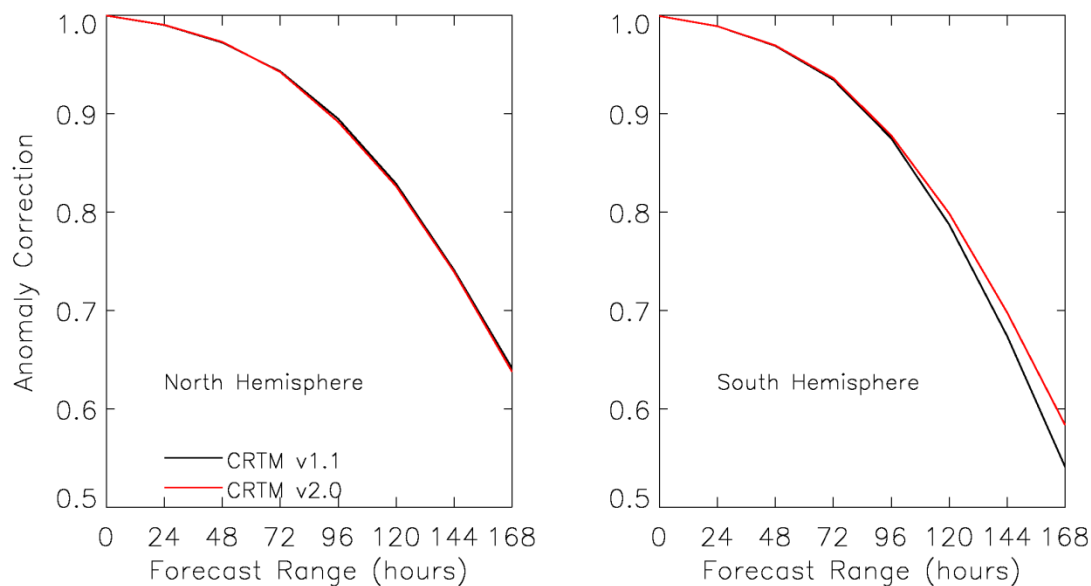
## **Mission:**

*...to accelerate and improve the quantitative use of research and operational satellite data in weather, ocean, climate and environmental analysis and prediction models.*

### 500 hPa geopotential height anomaly correction from 01/09/2008-02/22/2008



### 1000 hPa geopotential height anomaly correction from 01/09/2008-02/22/2008



# Weather Prediction and the US Economy; A Macroscopic View

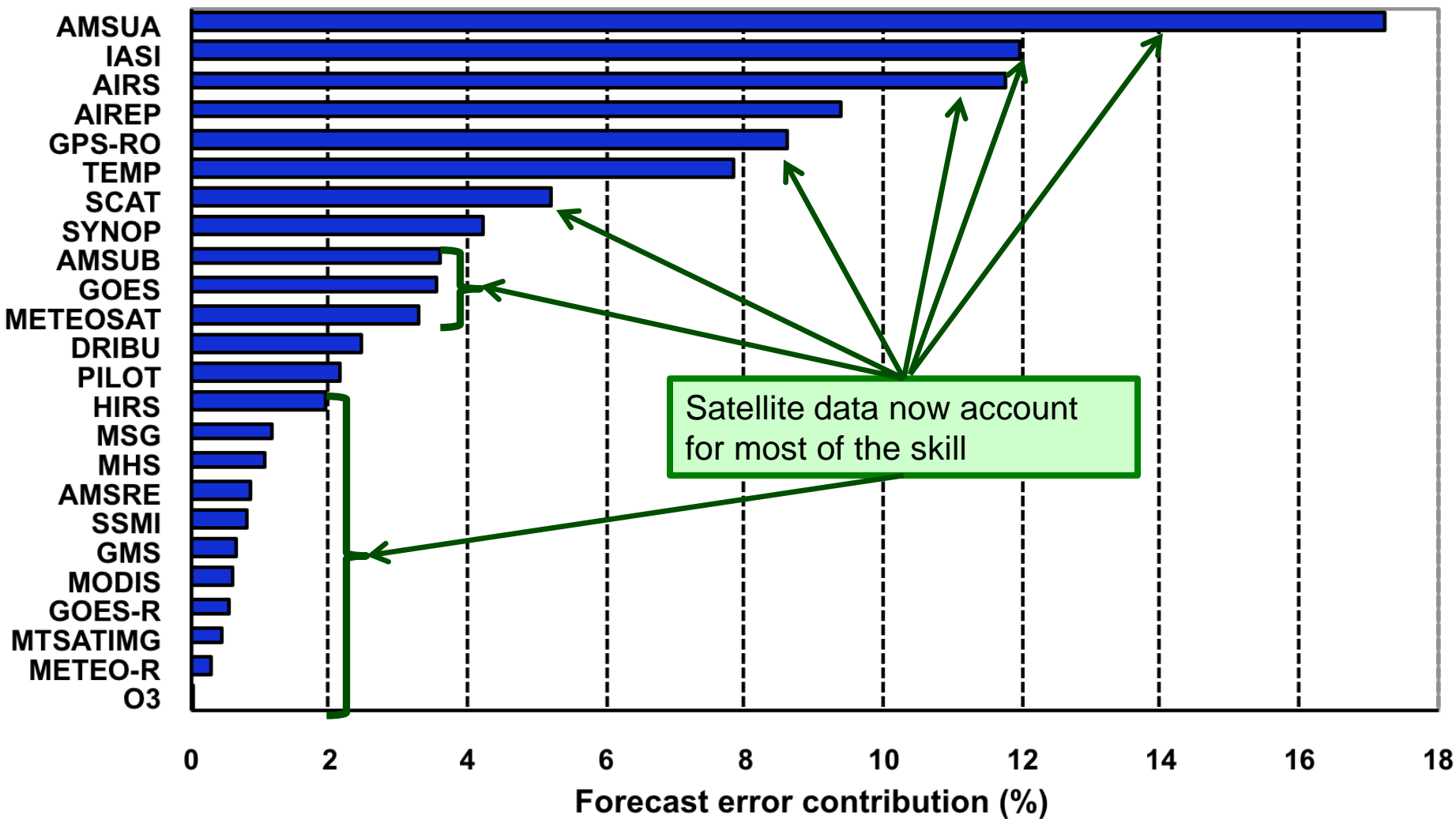
- Department of Commerce: “20% of overall US economy is weather sensitive”: **~\$3 trillion/year**
  - Impact to air and surface transportation, agriculture, construction, energy production and distribution, etc.
- Assume that half of this is “forecast sensitive”: **\$1.5 trillion/year**
- Assume that the potential savings due to weather forecasting amount to 5% of the “forecast sensitive total”: **~\$75B/year**

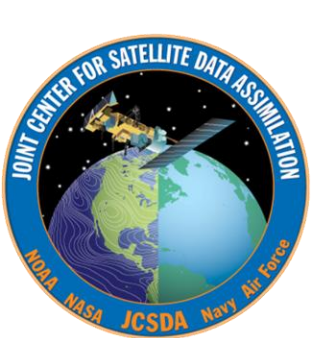
## ... a Macroscopic View ... (II)

- Define now
  - “No forecast information” = *0 h useful forecast range*
  - “Perfect forecast” = *336 h useful forecast range* (two weeks traditionally used as limit of predictability)
- Next, assume that the potential savings up to the maximum of \$75B are distributed linearly over the achieved forecast range for the global NWP system:
  - $\$75\text{B}/336\text{h} = \$223\text{M/hr}$
- This implies that the value to the United States economy of weather observations, dissemination, forecast products and services is >200M per hour of forecast range per year!

# Impact of GOS components on 24-h ECMWF Global Forecast skill

(courtesy of Erik Andersson, ECMWF)





# NPP-related efforts in the Joint Center

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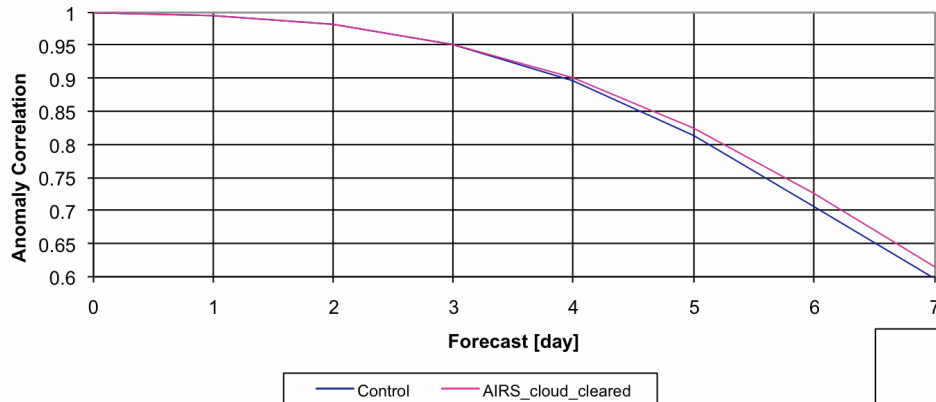
1. Improved use of legacy data
  - CrIS precursors (AIRS, IASI)
  - ATMS precursors (AMSU)
2. CRTM (radiative transfer model) modifications
3. Data flow/ingest of proxy data
4. Post-launch activities



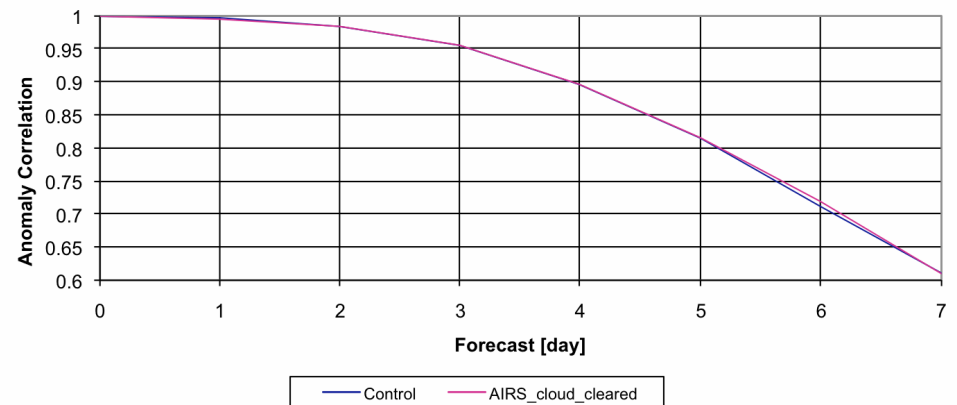


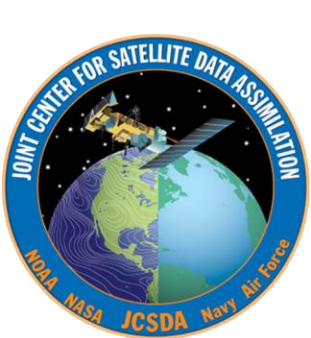
# Forecast impact of assimilation of AIRS cloud-cleared radiances

**N. Hemisphere 500 hPa AC Z**  
**20N - 80N Waves 1-20**  
**1 July - 31 Aug 2009**



**S. Hemisphere 500 hPa AC Z**  
**20S - 80S Waves 1-20**  
**1 July - 31 Aug 2009**





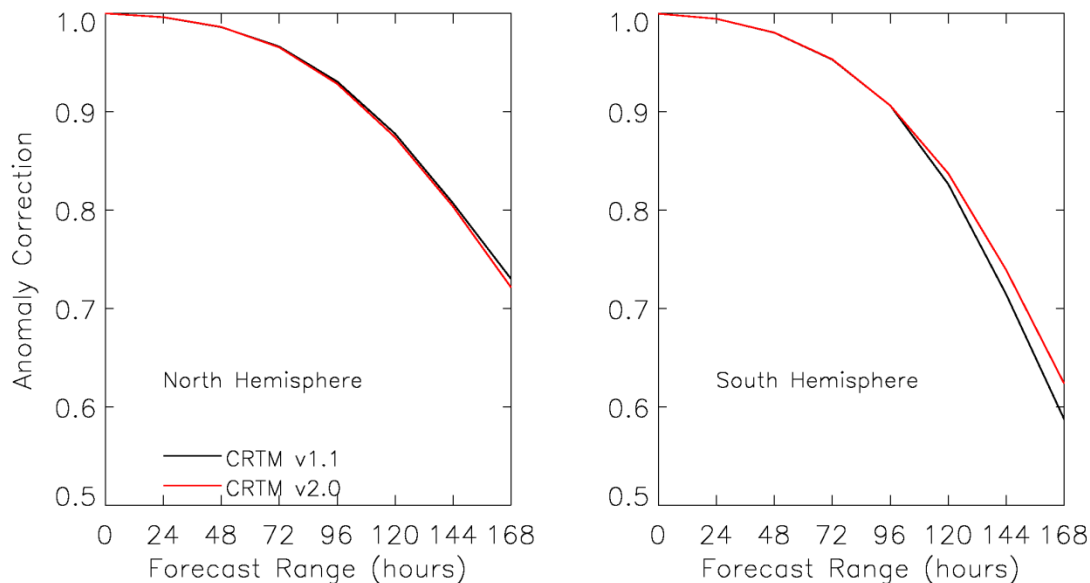
# CRTM status

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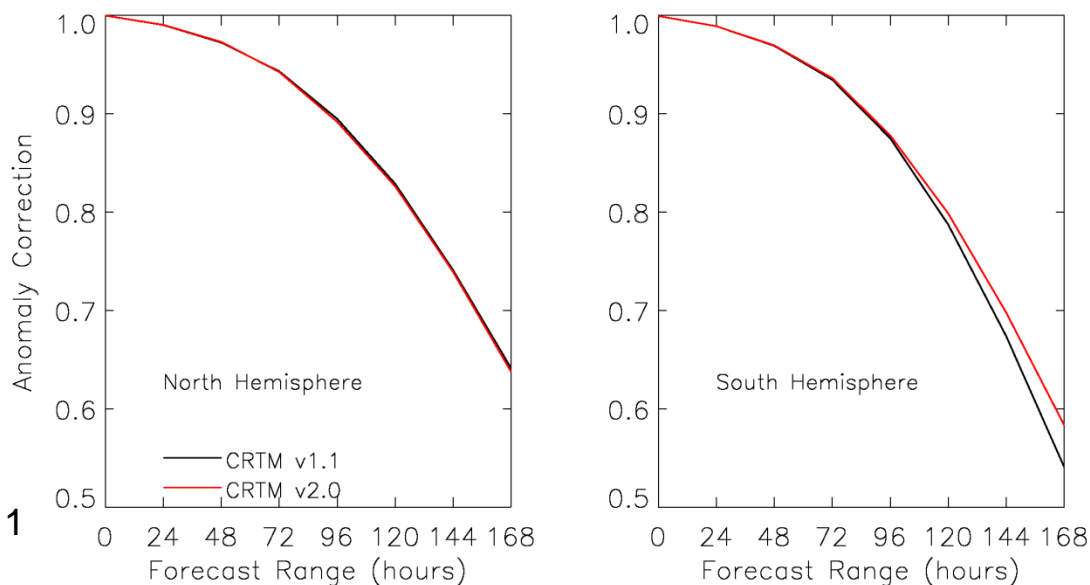
- CRTM ready for NPP sensors
  - CrIS
  - ATMS
  - VIIRS
- CRTM v. 2.1 released last year
  - Additional sensors
  - Computational efficiency



500 hPa geopotential height anomaly correction from 01/09/2008-02/22/2008



1000 hPa geopotential height anomaly correction from 01/09/2008-02/22/2008





# Post-launch activities

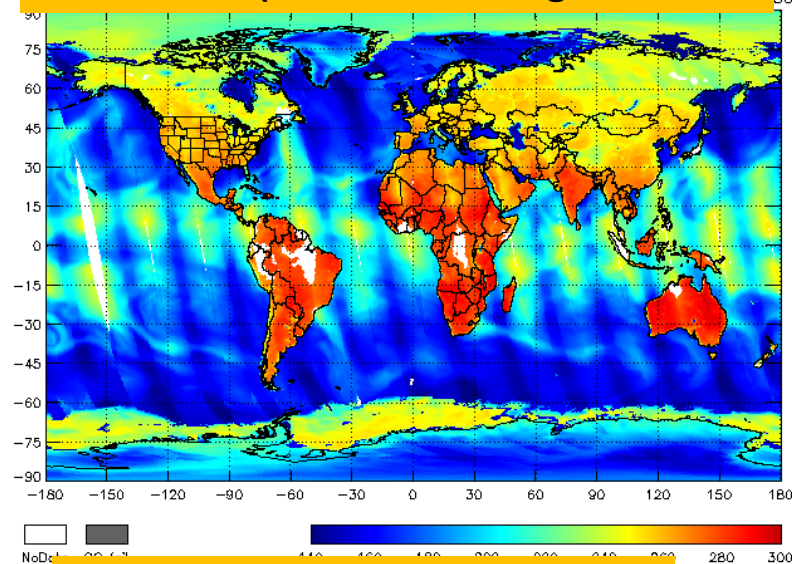
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- Passive monitoring
  - Observation minus forecast residuals
  - This effectively validates NPP data against the rest of the Global Observing System
- Active assimilation, off-line mode, impact assessment
- Operational assimilation
  - Tentatively scheduled for May 2011

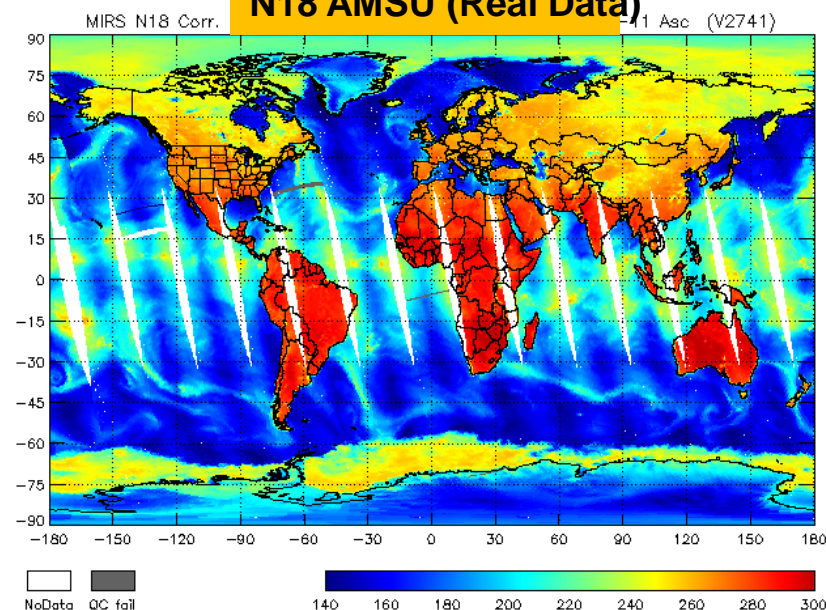
# ATMS Preliminary Assessment

(Radiometric Bias)

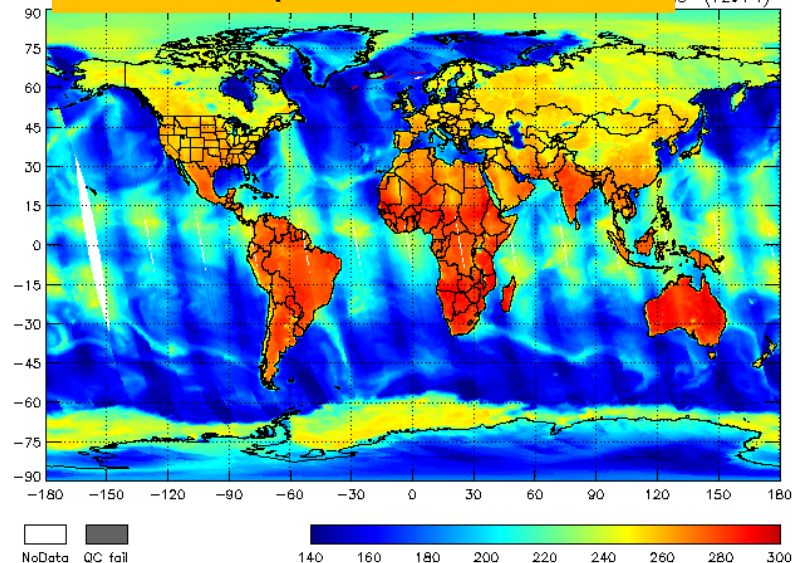
**MIRS/ATMS (Simulation using ECMWF/CRTM)**



**N18 AMSU (Real Data)**

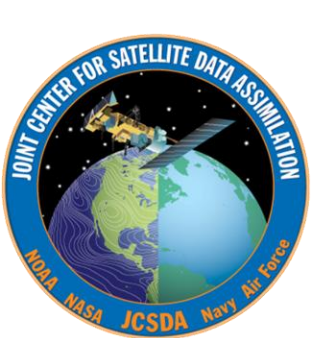


**NPP ATMS (Real Data, Bias corrected)**



Higher spatial resolution from ATMS  
Better coverage than AMSU (wider swath)

*Courtesy of Sid Boukabara, NESDIS/STAR*

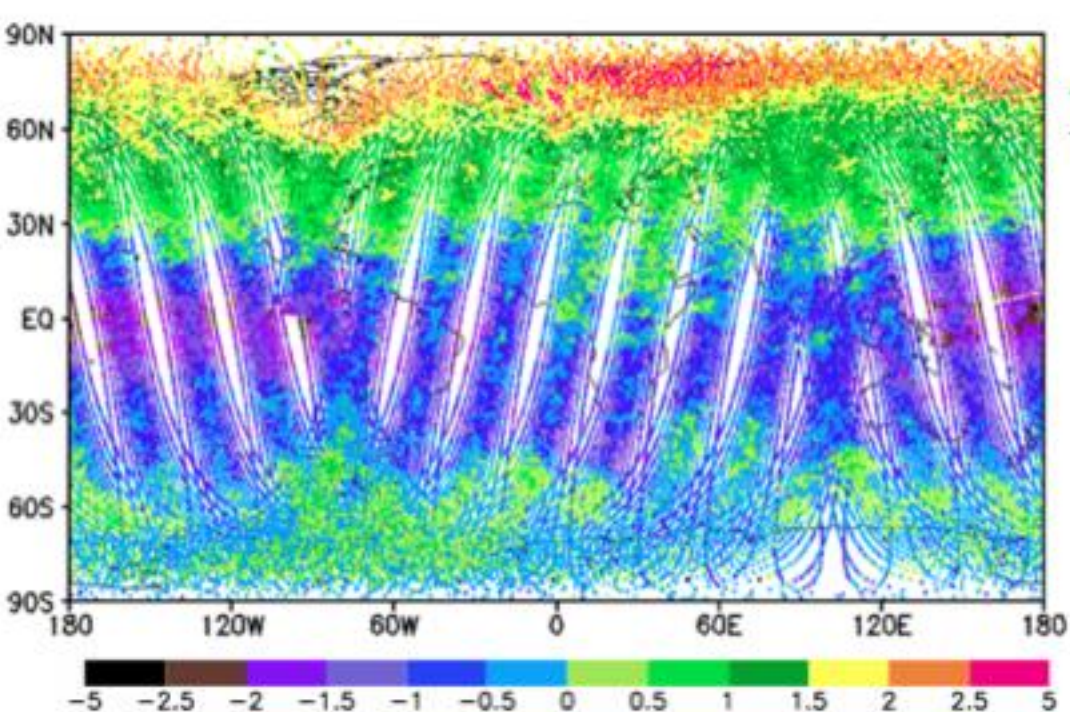


# Motivation for use of FY-3

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- WMO Vision for GOS in 2025:
  - *"Operational polar-orbiting sun-synchronous satellites distributed within 3 orbital planes (~13:30, 17:30, 21:30 ECT)", each flying MW and hyperspectral IR sounders, VIS/IR imager*
- Prior to the demise of the NPOESS Program this could be achieved by two NPOESS in combination with one MetOp spacecraft
  - This is no longer the case!
  - Broader international partnership/constellation will be needed



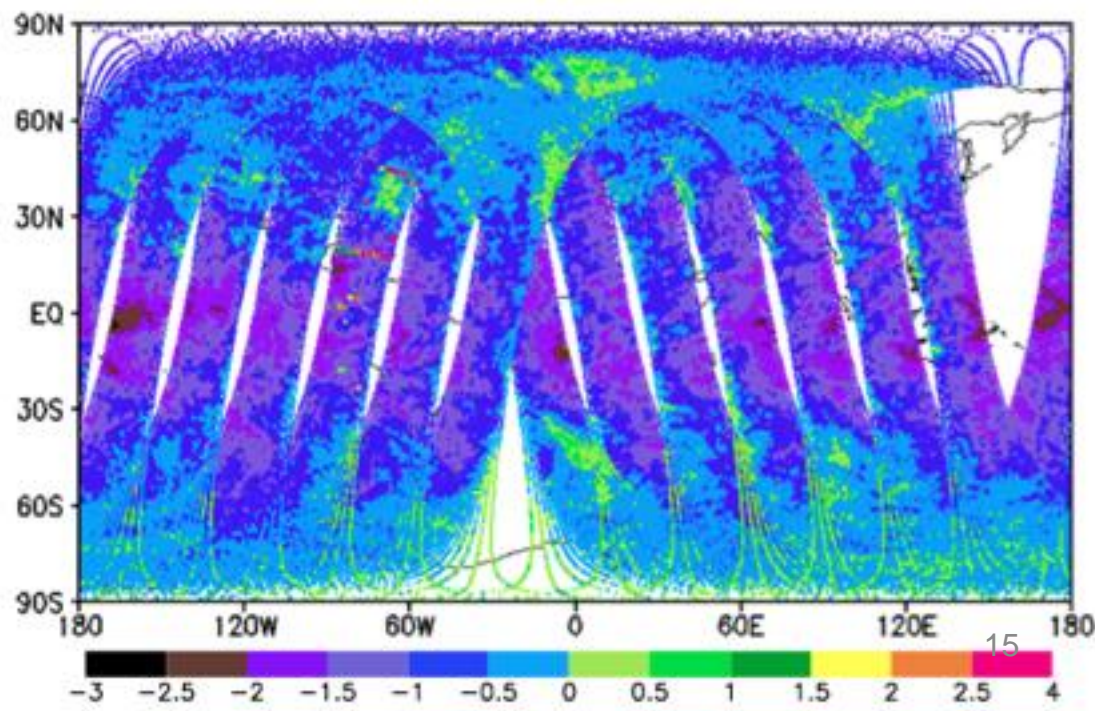


MWTS Ch4

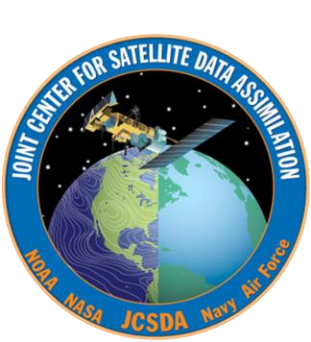
*O – B*

**0300UTC-1500 UTC**  
**January 2, 2010**

AMSU-A Ch9



Courtesy of Xiaolei Zou, FSU



# FY-3 status

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- We have sample data
- Some calibration and bias correction work done
- No routine data flow into operational NOAA computers; still issues to be sorted out





# Summary

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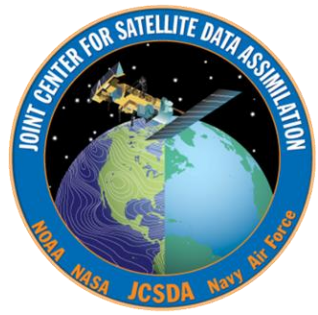
- Satellite data are critical for NWP skill
- Upcoming launch of NPP marks the entry of a new generation of operational meteorological satellites for the US
- FY-3 and other international satellites provide important contributions to the Global Observing System and helps realize the Vision for the GOS in 2025
- The Joint Center is heavily involved in preparing US operational users to benefit from these new data as soon as possible after launch



# 11<sup>th</sup> International Winds Workshop

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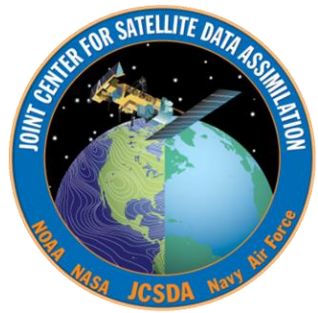
- Auckland, NZ, Feb 20-24, 2012
- Organized by the International Winds WG under the auspices of CGMS
- Focuses on the generation, improvement, utilization and impact of satellite winds (AMVs)
- Asia-Oceania region has great potential for closer collaboration on this due to extensive GEO coverage



# Fifth WMO Workshop on the Impact of Various Observing Systems on NWP



Sedona, AZ, May 22-26, 2012



# WMO Impact Workshop (II)

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- Organized jointly by THORPEX and OPAG-IOS under the WMO Commission for Basic Systems
  - Scientific Organizing Committee, Erik Andersson, ECMWF
  - Local Organizing Committee: Lars Peter Riishojgaard, JCSDA
- Premier venue for international comparison of impact studies
  - Held every four years
  - All major NWP centers worldwide expected to participate
- Participation is by invitation only
  - Deadline for abstracts has passed (talk to us if this is a problem)
  - Invitations can be requested from the organizers