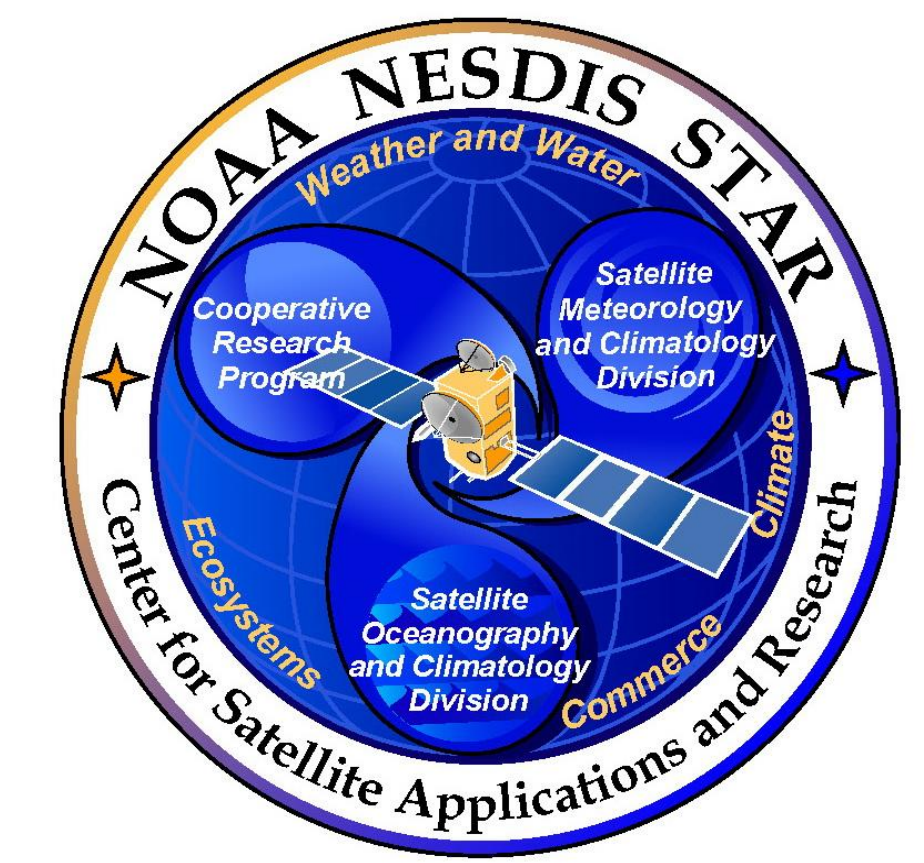


# Instrument Performance Monitoring Suite (IPMS) in STAR Integrated Cal/Val System (ICVS) for JPSS Program

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## ABSTRACT

The international community is becoming more interested in using JPSS/NPP sensor data in real-time for weather and climate applications after the JPSS/NPP is declared as an operational mission. The current NOAA POES real-time instrument performance monitoring (IPM) suite in STAR Integrated Cal/Val System (ICVS) can be enhanced to cover JPSS/NPP sensor in-orbit performance. The ICVS will trend the instrument noise, track instrument house-keeping information, and record any sensor stability anomalies into metadata files for future productions of climate data records (CDR). A global bias monitoring system (GBMS) will be developed for characterizing the JPSS/NPP sensor biases relative to both NCEP and ECMWF global forecasts (6-hour guess fields) as well as measurements from the reference sensors such as NOAA/METOP-A instruments. The WMO Global Space-Based Inter-Calibration System (GSICS) baseline algorithms ( e.g. Simultaneous Nadir Overpass (SNO) and Double Difference Technique (DDT) are used to cross-calibrate JPSS/NPP sensors to the reference sensors. The in-orbit performance parameters and inter-sensor biases from these systems are extremely important for building robust JPSS/NPP climate data records. As a demonstration, JPSS ATMS data, after its cross-calibration, are used to generate the atmospheric temperature data record. The existing NOAA Microwave Integrated Retrieval System (MiRS) will be used to retrieve the temperature and water vapor profile retrievals. These new temperature data records will be connected to those derived from MSU and AMSU-A on board previous NOAA satellites for long-term climate monitoring, which requires consistency, high precision and accuracy.

## Objectives:

1. Provide real time instrument radiometric telemetry monitoring for satellite calibration
2. Provide real time instrument sensitivity analysis for operational missions
3. Provide long term instrument stability monitoring for satellite climate change study
4. Provide X-Cal bias correction coefficients for satellite climate change study

## Satellites:

AMSU/MHS/AVHRR/HIRS onboard NOAA-19, MetOP-A, NOAA-18

SSMIS onboard DMSP F-16, F-17, F-18

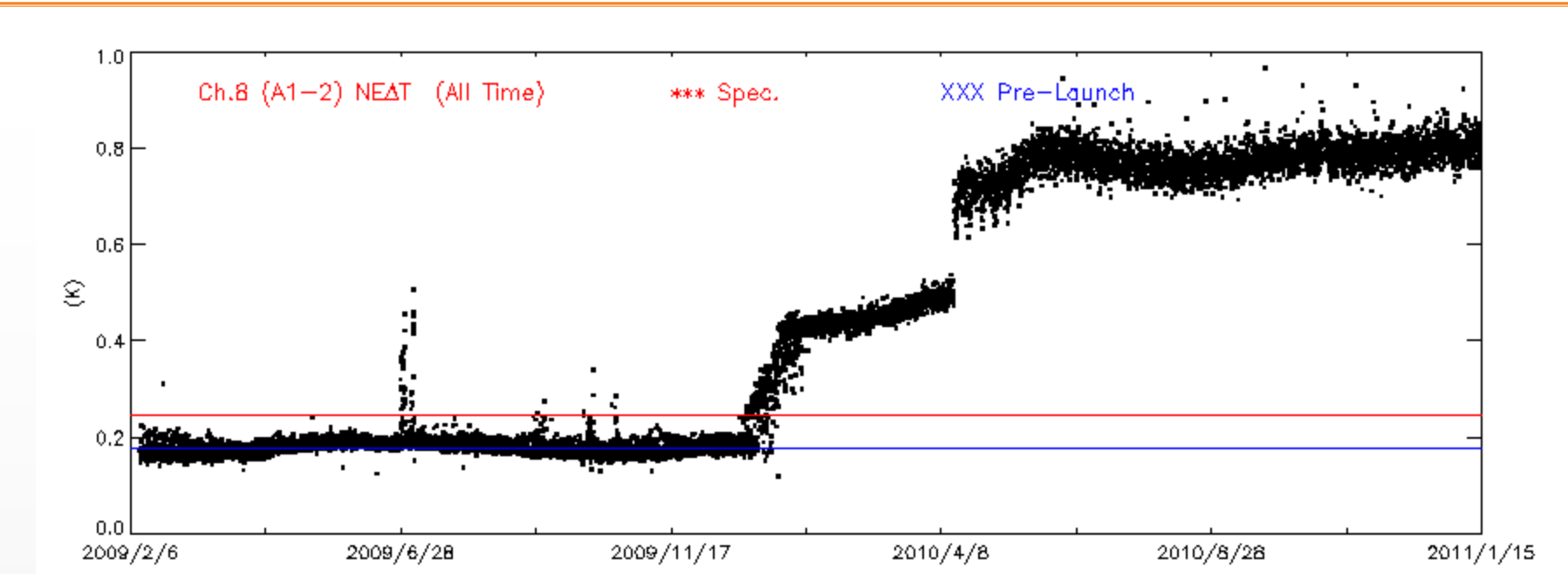
GOES 11/12/13/14/15 Sounder

## Monitored Parameters:

	AMSU-A	MHS	HIRS	AVHRR	SSMIS	GOES
Noise Equivalent Temperature Difference (NEΔT)	15 Channels	5 Channels	20 Channels (NEΔN)	3 IR Channels	N/A	18 (NEΔN) 18 (NEΔT)
Gain	15 Channels	5 Channels	20 Channels	3 IR Channels	24 Channels	N/A
Warm Load Calibration Count	15 Channels	5 Channels	20 Channels	3 IR Channels	24 Channels	18 Channels (internal)
Cold Space Calibration Count	15 Channels	5 Channels	20 Channels	5 Channels	24 Channels	18 Channels (internal)
Warm Load PRT Temperature	3 per Unit (A1-1/A1-2/A2)	5 Readings	4 Warm 1 Cold	4 Readings	3 Readings	internal
Digital Housekeeping Telemetry	45	24	20	12	28	internal
Analog Housekeeping Telemetry	27	18	16	22	N/A	internal
Orbital Status/Statistics	QC/Calib. Flag	QC/Calib. Flag	QC/Calib. Flag	QC/Calib. Flag	N/A	N/A
Tb Bias	N/A	N/A	N/A	N/A	N/A	18 Channels (AIRS/IASI)

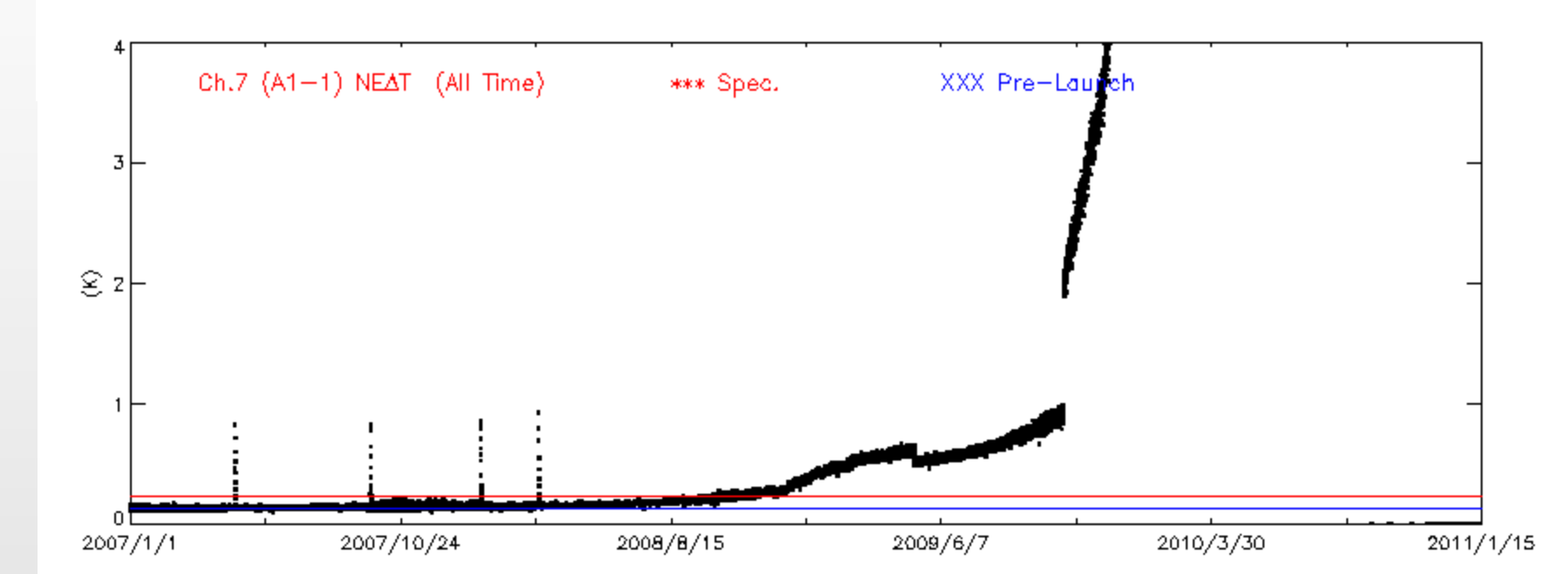
## ❖ NOAA-19 AMSU-A NEΔT

Channel 8 (55.5 GHz, A1-2)  
Out of Specification (0.25 K)



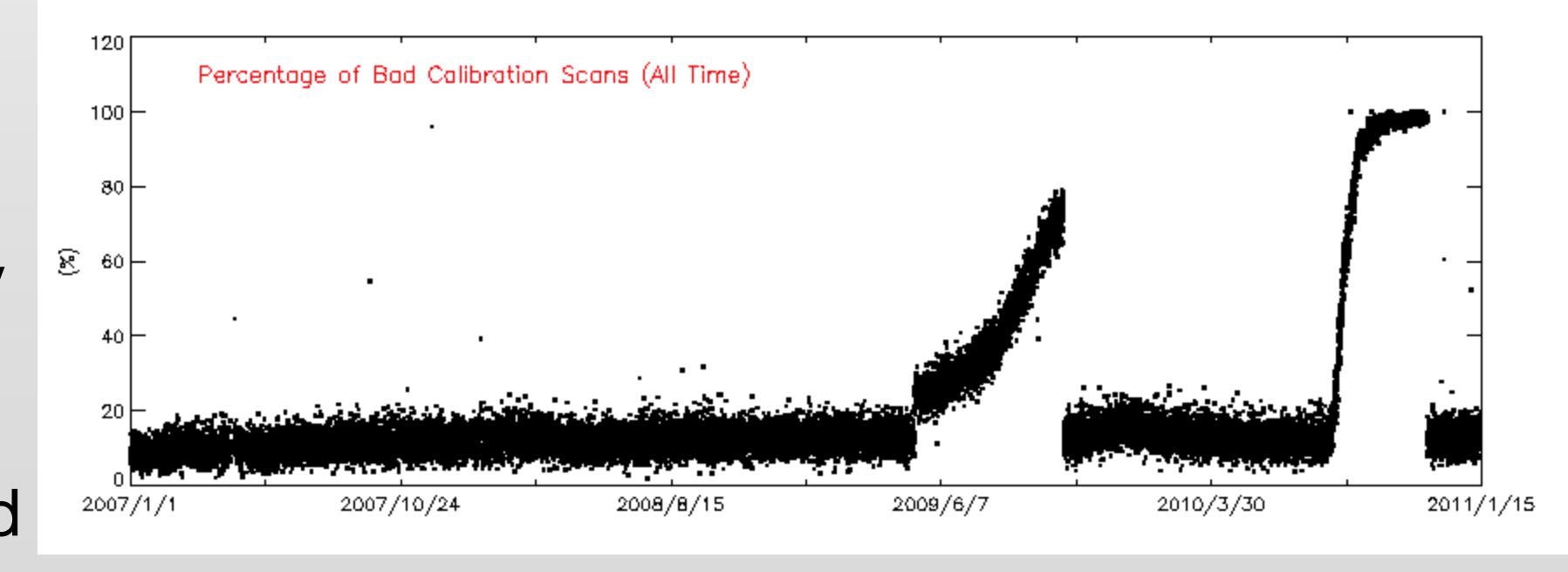
## ❖ METOP-A AMSU-A NEΔT

Channel 7 (54.94 GHz, A1-1)  
Out of Specification (0.25 K)



## ❖ METOP-A Scan QC Flag

Percentage of failed scan is consistent with Ch.7 anomaly



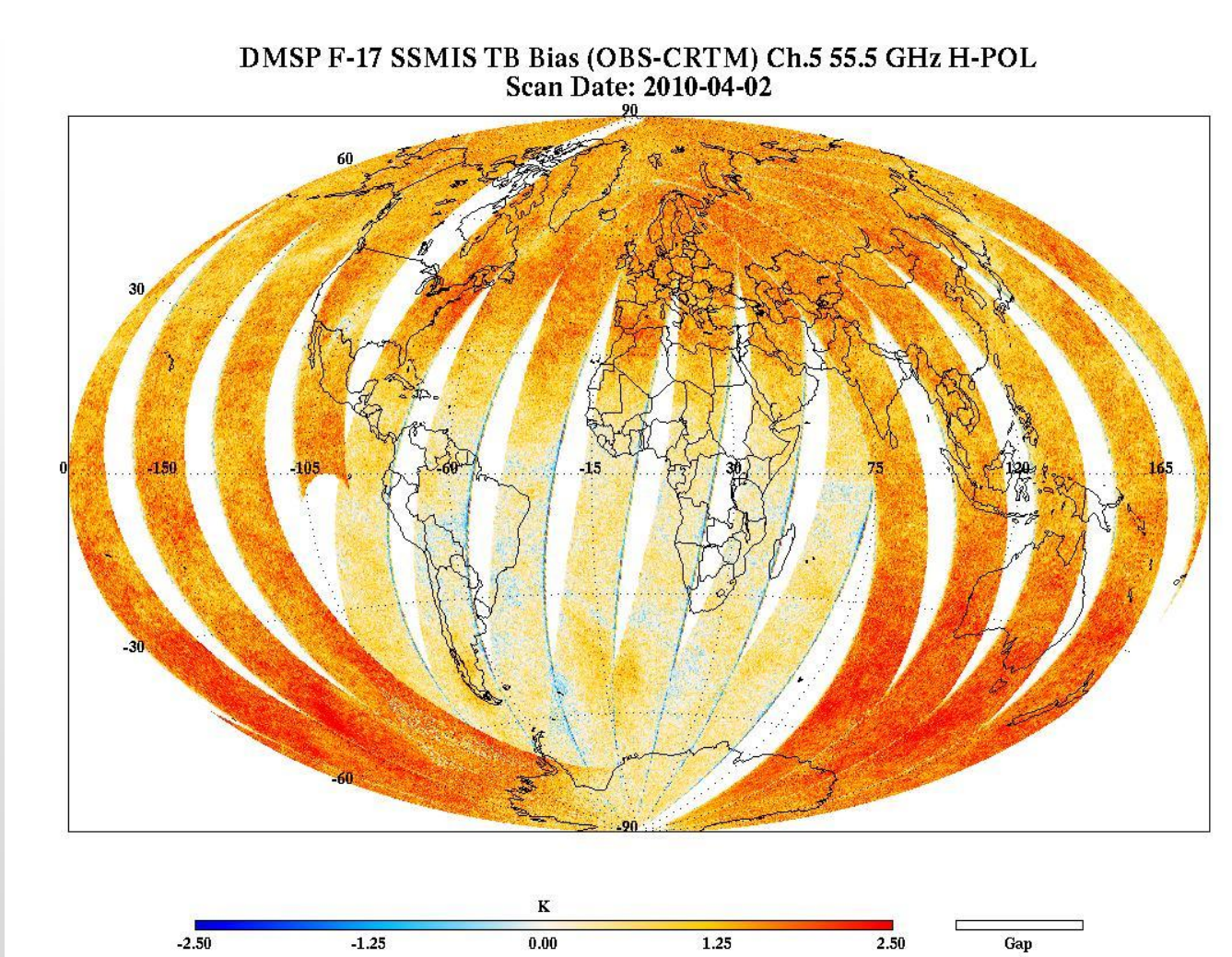
Operational adjustment is recommended and conducted to flag channel fail rather than scan fail since Dec. 2010

## Instrument Performance Monitoring Suite - Telemetry

### Current Instrument Performance Monitoring Suite for POES/DMSP/GOES

## Instrument Performance Monitoring Suite - Bias

❖ Instrument measurement accuracy can be evaluated by comparing observation and model simulation (O-B)



❖ O-B bias helps identify instrument calibration problem

❖ Long term bias trending provide valuable information for climate data records generation and new instrument design

## ANOMALY EXAMPLE – NOAA 19 MHS

## SUMMARY AND FUTURE WORKS

- IPM Suite provides real time instrument telemetry, digital and analog, and sensitivity key information for satellite application in NOAA operational missions
- IPM Suite provides long term instrument stability information for production of climate data records (CDRs) for global climate change study
- IPM Suite will provide instrument bias trending relative to NCEP and ECMWF numerical products to produce cross-calibration coefficients for CDR generation
- IPM Suite is ready for the future NPP/JPSS satellites in JPSS Program

## REFERENCES AND ACKNOWLEDGMENT

1. Mo, T., 2002: Pre-launch calibration of the advanced microwave sounding unit-A for NOAA-K. *IEEE Transactions on Geoscience and Remote Sensing*, **44**, 1460 -1469.
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