Operations Status and AIRS Trends

Denis Elliott

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AIRS Operations Status
AIRS Operational Status

- AIRS is in excellent health
- All engineering parameter plots versus time are either flat or changing extremely slowly—no concerns
- Some channels have degraded noise performance due to radiation dosage
  - Many of the degraded channels had their noise performance significantly improved last January by revising the on-board gain table
AIRS Chopper Drive Current
AIRS Scan Mirror Temperature

AIRS SCMIRORETEMP for 20020901-20121106
• The scan mirror temperature anomaly is the difference between the measured temperature and a fit that follows seasonal variations.
AIRS Choke Point Heater Current

AIRS Choke Heater Current for 20020901-20121106

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AIRS Cooler A Drive Level for 20020901-20121106

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AIRS Cooler B Drive Level

AIRS Cooler B Drive Level for 20020901-20121106

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AIRS Focal Plane Temperature

AIRS Focal Plane Temp for 20020901-20121106

FPDETT/MPYA (K)

Effect of January gain table change

L1BQA flags: Number of channels flagged for high noise, popping

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AMSU-A Status
AMSU-A Operational Status

- AMSU-A mechanical parts and most of the electronics are in good health
- All engineering parameter trends are slow
- The A1-1 and A1-2 scanner currents are rising, but very slowly and are not alarming
- 10 of the 15 channels are healthy, but
  - Channel 4 failed in 2007 (declared non-operational on October 1, 2007)
  - Channel 5 is now too noisy to contribute to Level 2
  - Channel 7 noise has exceeded specs since launch and has never been used for L2
  - Channel 6 has been degrading slowly since 2008, but is still a good channel—its NEΔT may actually be oscillatory (see later chart)
  - Channel 1 began degrading in January 2012, but is still a good channel
AMSU-A1-1 RF Shelf Temperature

AMSU Ant 1-1 RF Shelf Temp for 20020701-20121106

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AMSU-A2 RF Shelf Temperature

AMSU Ant 2 RF Shelf Temp for 20020701-20121106
AMSU-A1-2 Noisy Bus Current

AMSU Ant 1-2 Noisy Power Bus Curr for 20020701-20121106

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AMSU-A Channel 5 NEΔT
AMSU-A Channel 1 $\Delta T$

AMSU Ant 2 NeDT Chan[1] for 20020725-20121105
Aqua Status
And
Anomalies
Aqua Spacecraft Health Status

- Aqua is in very good health
- Several anomalies have occurred over the years
- All are considered minor
- None have yet impacted operations
Aqua Fuel Supply

- Occasional drag make up burns use only a very small amount of fuel

- Most fuel usage takes place in orbital inclination adjustment maneuvers, needed to keep Aqua properly aligned with other A-train instruments and to tightly control our 1:30 pm crossing time
  - *Three or four such maneuvers are planned every year, near the vernal equinox*
  - *A recent estimate of future fuel usage indicates that the hydrazine should last at least until 2020, and possibly longer*
Projected Aqua Fuel Usage

Aqua spacecraft has sufficient fuel to maintain its current orbit within the Afternoon Constellation through 2020 and possibly beyond – analysis will be extended for October A-Train MOWG.
AMSR-E Spin-up Plans
AMSR-E Anomaly Background

• Suffered numerous anomalies (excess commanded torque and excess current in scanner) over the past several years

• On October 4 2011, in response to the largest of these anomalies yet seen, the instrument was commanded to slow from 40 rpm to 4 rpm

• When problems continued even at 4 rpm the antenna was parked

• Lubricant failure is probable cause

• Spacecraft jitter was seen in AIRS geolocation data during the spin down, but there was no noticeable impact to science on AIRS or any of the other instruments
AMSR-E Spin-Up

- Not yet declared dead

- AMSR-E team requested a spin-up to 4 rpm to enable cross-calibration with a new instrument, AMSR2, which was launched on GCOM-W1 on May 18, 2012

- On September 19 and 20, six attempts were made to spin AMSR-E up to 4 RPM—all failed to reach their goal, but the antenna did complete over 2 revolutions

- Planning for a spin-up to 2 RPM on December 4 is in progress

- JAXA wants AMSR-E to stay at 2 RPM at least two months
AIRS Trends
Trends Introduction

• We are now able to examine AIRS trends over a full 10-year period
  – obs – calc over oceans
  – brightness temperature comparisons at specific sites
  – AIRS and the automated weather station at Dome C
  – Trends in the AIRS spectral frequency shifts

• We are also able to compare AIRS and IASI over a 5-year period

• For this talk I will just show the AIRS Dome C and spectral frequency trends—the other topics have been or will be covered by others at this meeting
Dome C surface temperature from AWS8989 with seasonal fit trend $-1 \pm 55$ mK/yr
AIRS vs Dome C weather station

1231 - AWS9899 trend +10 ± 5 mK/yr mean bias -4 K
AIRS long-term and seasonal spectral shifts (from Aumann)
Spectral shifts using channels on slopes of a line (from Aumann)

- Shifts determined using the difference between channels #448 and #450
  - They straddle the CO$_2$ Q-branch at 791.7 cm$^{-1}$
- A shift of plus one micron in the focal plane (1% of the SRF width) makes #448 warmer by 0.161K, while it makes #450 colder by 0.122K under tropical ocean clear conditions
- This difference is shown on the previous slide
  - between 2002 and 2009 the difference steadily decreased at the rate of -0.028K/yr, corresponding to a focal plane shift of -0.1µm/yr
  - starting in 2009 the shift reversed to +0.03µm/yr
  - superimposed on this long-term trend is a seasonal peak-to-peak modulation of 0.05K (that is 0.2 µm [0.2% of the SRF]) and an orbital oscillation
• Backup
- The above chart is from the reference
- Note the sharp drop off of IASI spectra counts starting at 240 K
- Above 250 K no IASI spectra appear at all, although AIRS does see some scenes as warm as 255 K
• Note that the AIRS versus IASI difference is small at very low temperatures and also at the higher temperatures seen at Surgut
• Note also that for Surgut the difference is near zero all the way down to 230 K (the lowest temperatures seen at Surgut)
• But for temperatures above 215 K at Dome C the difference is as high as 5 K
  – Apparently, some IASI Dome C spectra are influenced by the interference problem even when they pass the on-board quality check. The observed brightness temperatures are affected.
Here, before calculating daily means, we have eliminated all spectra with a brightness temperature in the range 240–260 K

Of course the noise is increased in and around that range

Note that the AIRS - IASI difference for Dome C in the range 230 to 240 has noticeably decreased and the distribution has tightened—further evidence that IASI spectra at Dome C are affected by the interference problem even when they pass quality control, at scene temperatures as low as 215 K