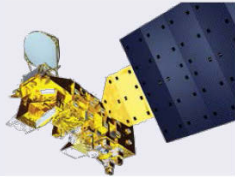

AIRS Project Status

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November 13, 2012

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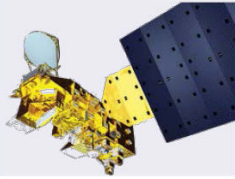
Project Status Overview



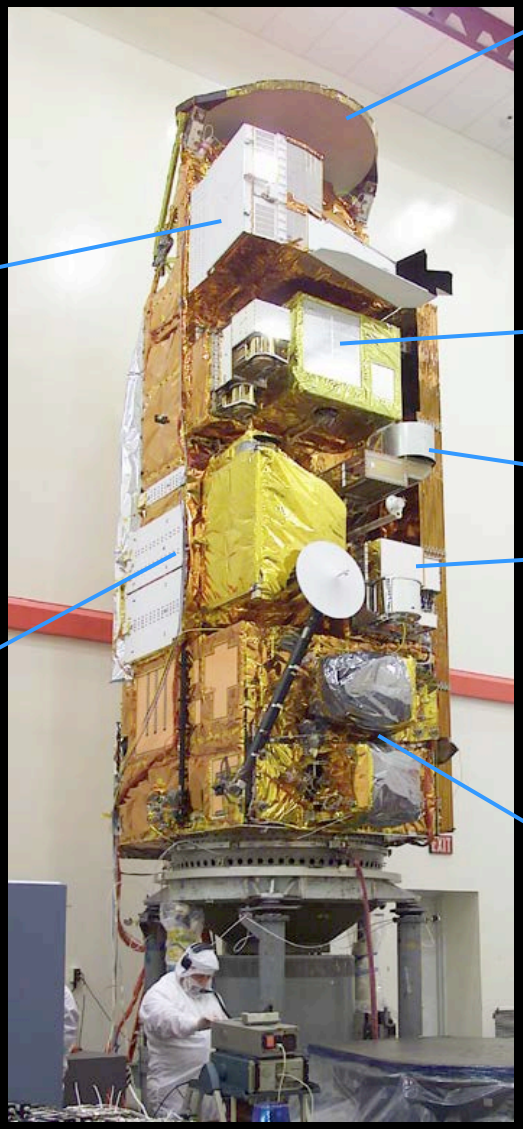
- Instrument Operations and Calibration
  - AIRS Running well. AMSU hanging in there. Aqua Has Fuel to 2022
  - Regular Maintenance and Orbital Maneuvers Performed
  - Channel degradation mitigated with gain table upload in January 2012
  - Calibration Coefficients Update in progress using Moon, Parylene, Earth
- Version 6
  - V6 PGE Complete. Delivered to DAAC for routine processing. Expect public release in first quarter 2012
  - Test Report Complete. Over 145 pages + Appendices
  - User Guides, ATBD, Validation Report in process
- Additional V6 Work Remainig
  - Level 1C, Level 3, 3v (for visualizations)
  - V6 Carbon Dioxide Mid and Strat
  - Operational SO2 Product
  - Update Website

The EOS Aqua Spacecraft

Launched May 4, 2002

Moderate Resolution Imaging Spectroradiometer (MODIS)
GSFC/Raytheon

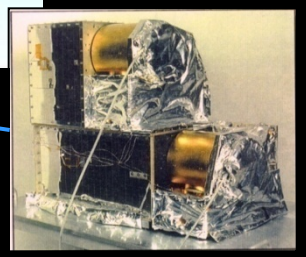
Atmospheric Infrared Sounder (AIRS)
JPL/BAE SYSTEMS



AQUA Spacecraft
GSFC/NGST

Advanced Microwave Scanning Radiometer (AMSR-E)
MSFC/JAXA

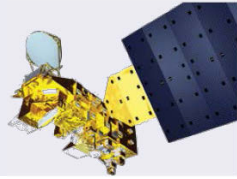
Advanced Microwave Sounding Units (AMSU-A/B)
JPL/Aerojet

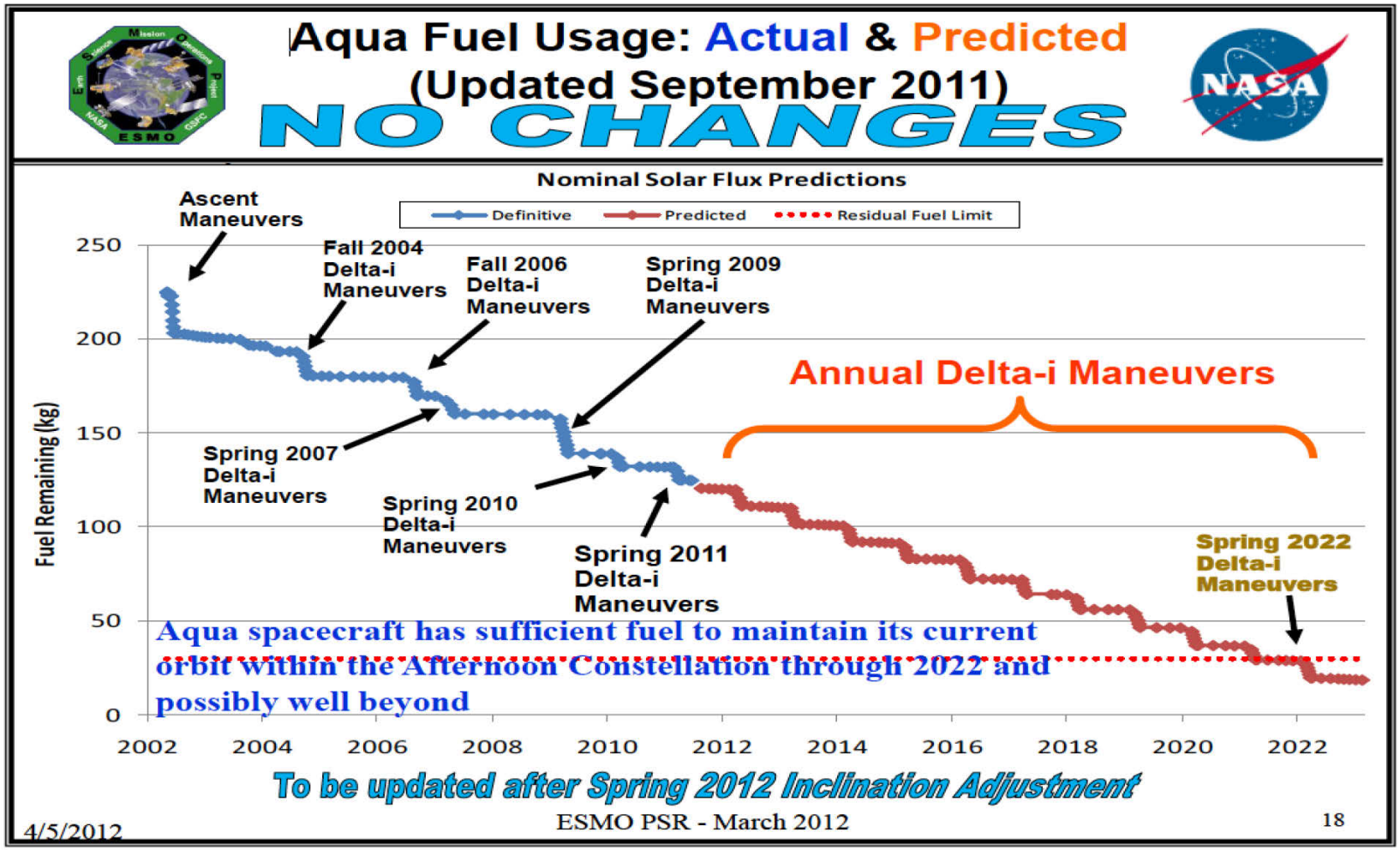


Humidity Sounder from Brazil (HSB)
JPL/Aerojet

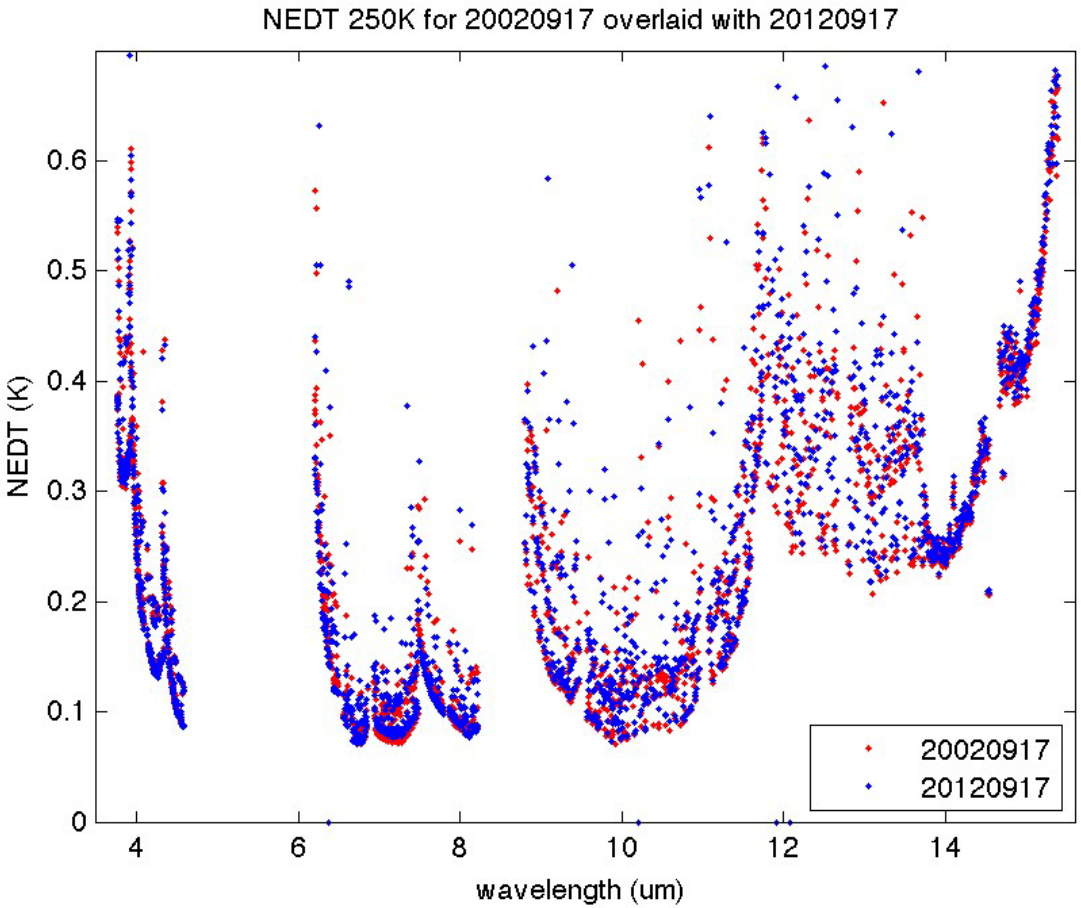
Clouds and Earth Radiant Energy System (CERES)
LaRC/NGST

AIRS Expected to Operate For Life of Spacecraft through 2022



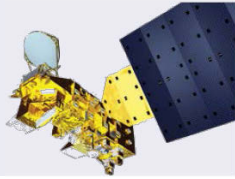


NEdT's Stable over 10 Year Period for Most Channels

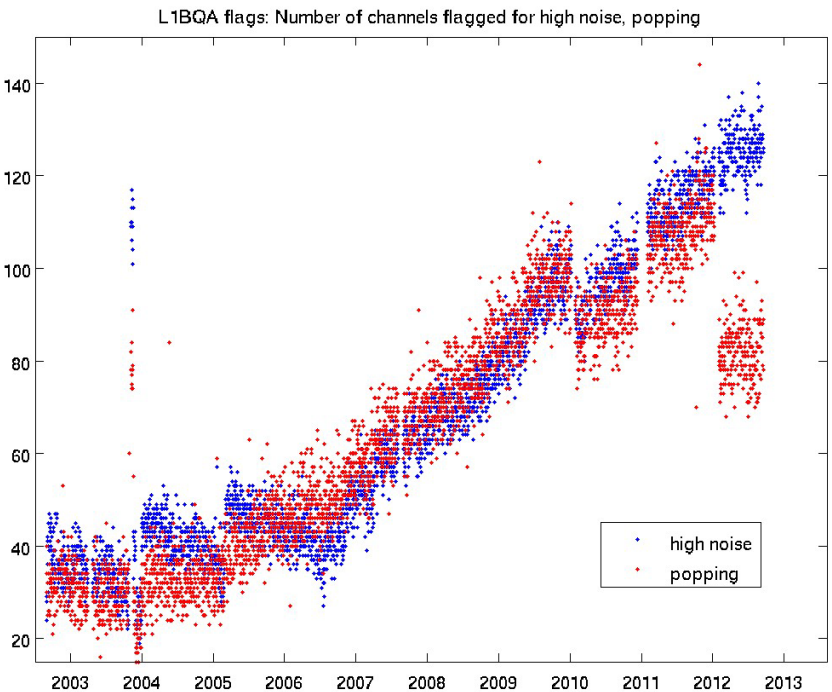


<u>Pre-Launch</u>:
1856 Channels "Good"
180 were "Poor": High Noise but Usable
68 were "Bad": Non-Gaussian Noise, Un-usable

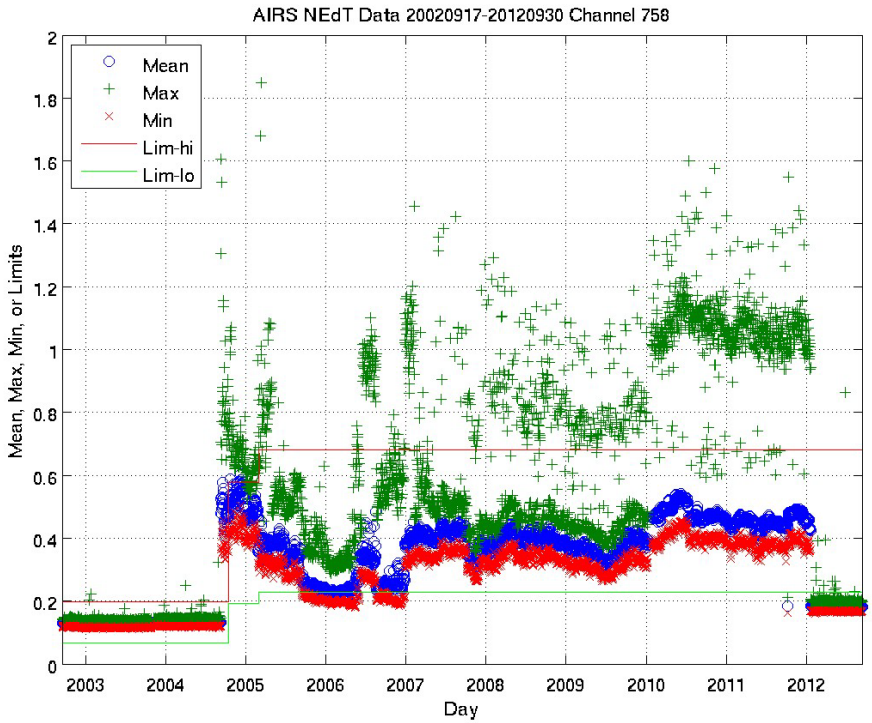
Several Channels Degraded in Noise Performance over Mission Life



80-100 Channels Degraded in Noise Performance over Course of Mission

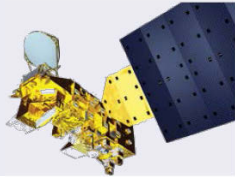


Example Channel Noise Impact due to Single Event Upset (SEU)



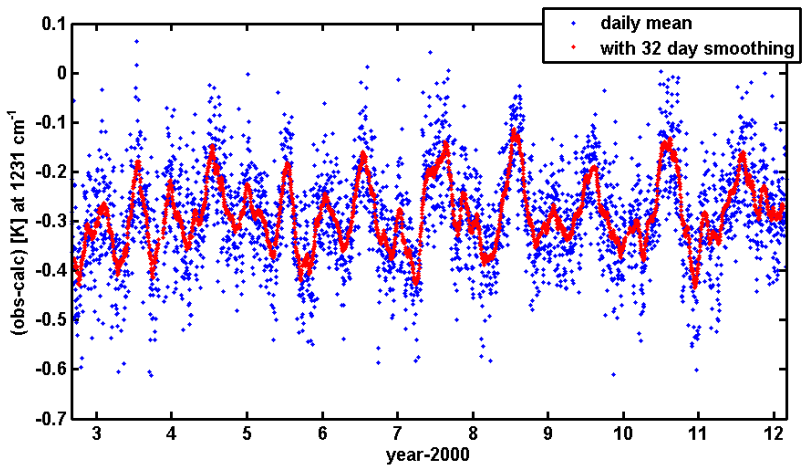
New Gain Table Modified 100 Channels A/B States Reduced Noise and Recovered about 50 Channels

Exceptional Stability in AIRS Radiances



Radiometric Stability

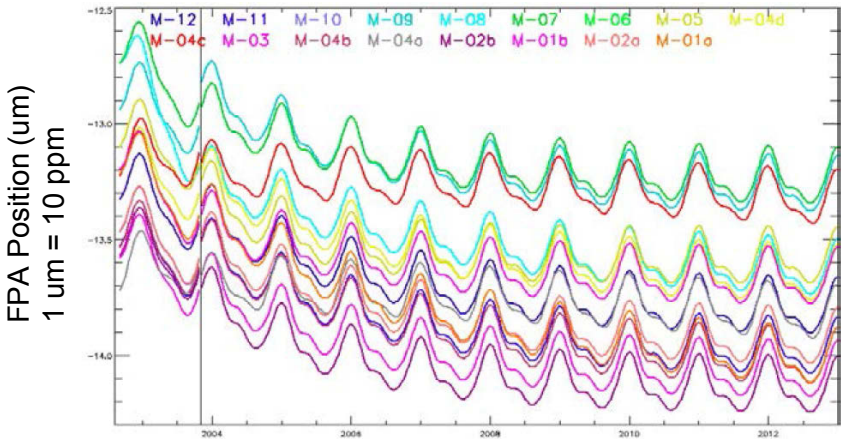
Channel 1231 cm^{-1}: +4 ± 1 mK/yr
Channel 2616 cm^{-1}: < 16 mK/year



Aumann, H. H., D. Elliott, S. Strow, "Validation of the Radiometric Stability of the Atmospheric Infrared Sounder." Proc. SPIE 8510-28, August, 2012

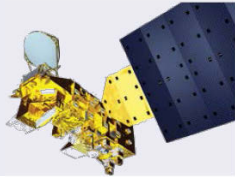
Spectral Stability

<5 ppm over mission



Strow, L. L., S. E. Hannon, S. De-Souza Machado, H. E. Motteler, and D. C. Tobin (2006), "Validation of the Atmospheric Infrared Sounder radiative transfer algorithm", J. Geophys. Res., 111, D09S06, doi:10.1029/2005JD006146

AIRS V6 Testing Complete
Lower RMS error and trend than V5



Version 6 Test Report

AIRS/AMSU/HSB Version 6 Level 2 Performance and Test Report

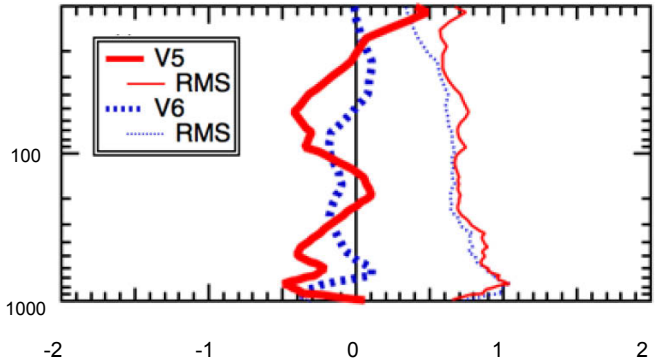
Edited by:
H. Van T. Dang
Contributions by:
Evan Manning[1], Sun Wong[1], Fedrick Irion[1], H. Van T. Dang[1], Glynn Hulley[1], Joel Susskind[2], Lena F. Iredell[2], John M. Blaisdell[2], Gyula Molnar[2], Bjorn H. Lambrigtsen[1], Brian H. Kahn[1], Xiaozhen Xiong[3], Juying Warner[4], Baijun Tian[1], Larrabee Strow[5], Joao Teixeira[1]

[1]Jet Propulsion Laboratory, California Institute of Technology
[2]NASA Goddard Space Flight Center
[3]NOAA
[4] Dept. of Atmospheric & Oceanic Sciences, University of Maryland
[5]Physics Department, UMBC

October, 2012
Version 1

Page 1

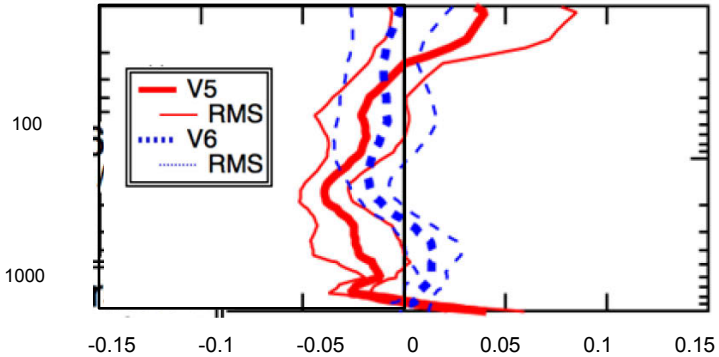
Bias and RMS (30º-60º)



AIRS-Sonde Modified by AIRS Averaging Kernel (K)

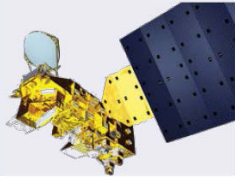
W. Irion (JPL)

Annual Drift (30º-60º)

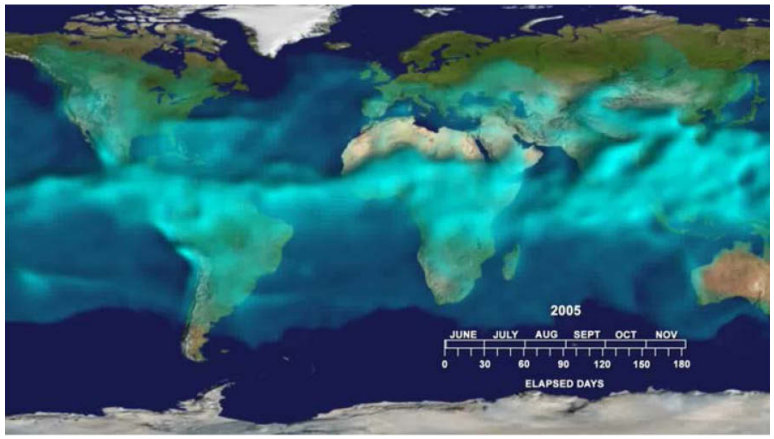


AIRS-Sonde Temperature Bias Drift (K/yr)

What's Next: Product Development and Utilization

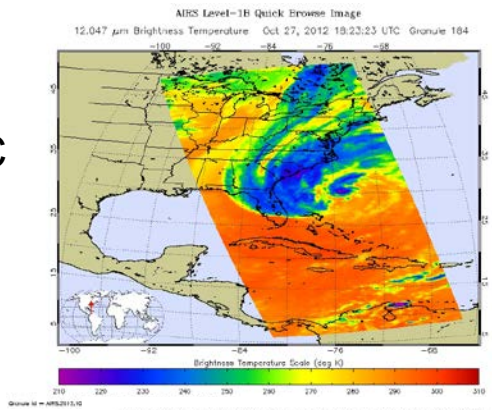


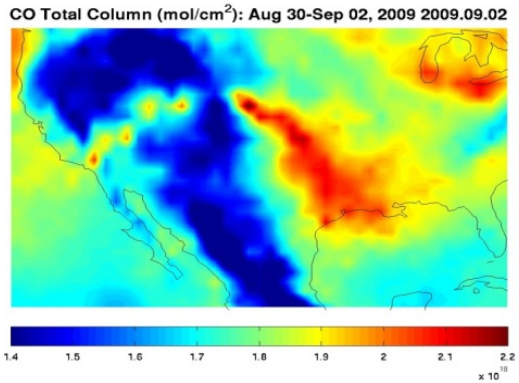
- Product Development (V7)
  - Improved Error Estimation
  - Improved Cloud Clearing Algorithm
  - Retrieval of Cloud Properties
  - Higher Spatial Resolution
  - Explore use of data sets from other instruments
  - Composition Products
- Support Weather Forecasting
  - Assimilation of Cloudy Radiances
- Additional Work
  - Retrieval of CO2 Profile
  - Climatologies of all AIRS Products; Including Error Estimates
- Radiance Calibration
  - Radiometric/Polarimetric Coefficient Update
  - CrIS/IASI Comparisons

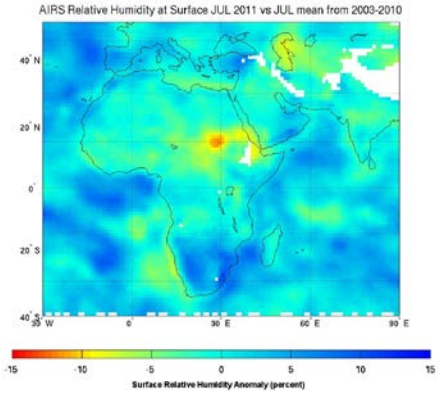


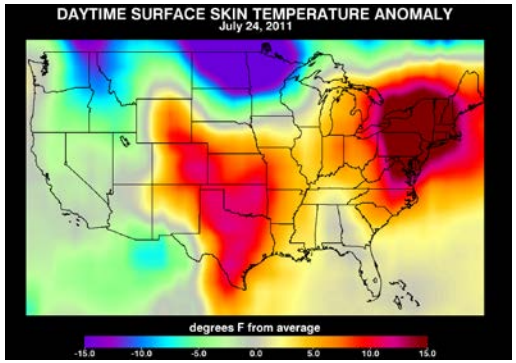
What's Next: Applications

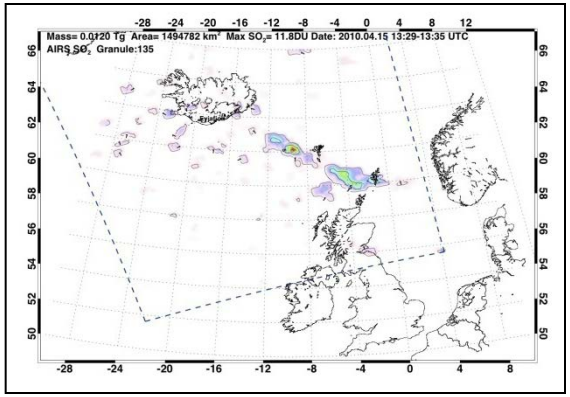
- Near Real Time Products
  - All Level 1B, Level 2 at DAAC
  - L1B Buffer NWP Centers
  - Hurricane Maps
  - CO, SO2 WMS at LANCE
- Under Development
  - Relative Humidity for Forecasters: SPoRT, University of Colorado
  - Temperature Extremes, Inversions (JPL)
  - Near Surface RH, Drought, Mosquitos: JPL
  - Volcanic SO2 and Ash: Fred Prata, OMI
  - Dust: UMBC
  - Carbon Monoxide Air Quality and Fire Assessment: GSFC
  - Ozone Hole, TBD OMI





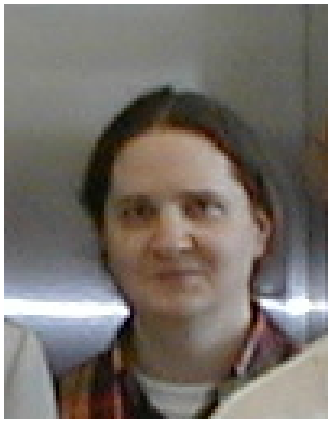






Remembering Sounder Team Champions

Scott Hannon

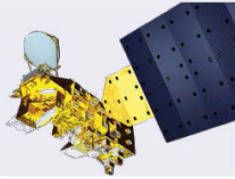


- UMBC
  - Worked with Larrabee Strow on the AIRS Project for last 15 years
- Fast RTA (SARTA)
- Added Non-LTE to SARTA
- Wrote Trace Gas Retrievals

Gyula Molnar

- GSFC - Morgan State University /GESTAR)
  - Hungary-Oxford-AER
  - Worked with Joel Susskind on the AIRS Project since 2003.
- Climate Research using AIRS
- Susskind, J., G. Molnar, L. Iredell, and N. G. Loeb (2012), Interannual variability of OLR as observed by AIRS and CERES, *J. Geophys. Res.*, doi:10.1029/2012JD017997, in press.

Conclusions



- AIRS Instrument Running Well; AMSU lost channel 5 but OK
  - Recovered 50+ AIRS channels in last gain table upload
- Version 6 PGE is complete; documentation underway
  - Reduced RMS error, trends and higher yield
- Next major objectives for AIRS community:
  - Support assimilation of cloudy radiances
  - Increase number of applications using AIRS data
  - Develop new retrieval system considering continuity amongst instruments
  - Compare AIRS products to CrIS and IASI for climate continuity
  - Future Mission Roadmap

- Logistics
  - Starbucks
  - Lunch Buffet: $14.95