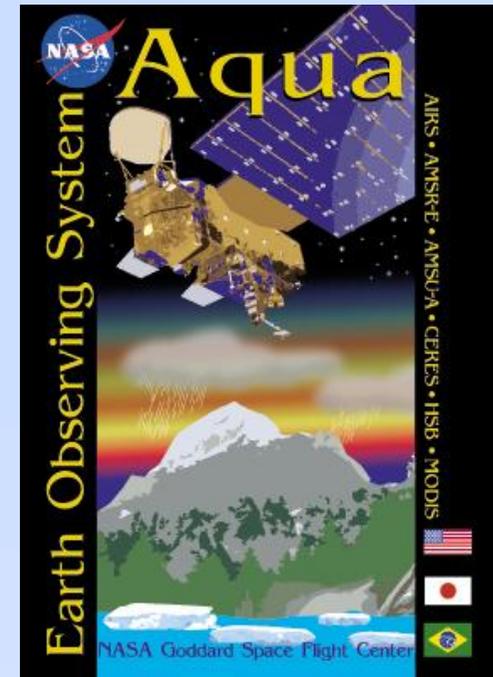
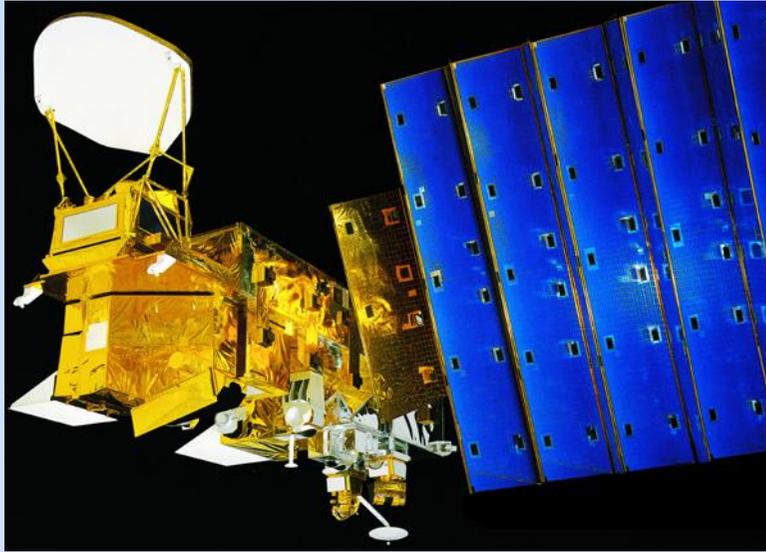


Aqua Status

Steve Platnick
Aqua Deputy Project Scientist

MODIS Science Team Meeting
BWI Marriott
22 March 2005





Topics

- Spacecraft/instrument status and mission operations
- Instrument data processing status and science highlights



Non-MODIS Aqua Payload & Lead Institutions

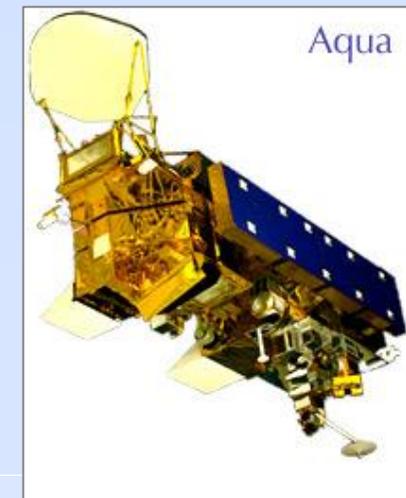
- AIRS, AMSU, HSB (Brazil) cross-track sounding suite: JPL (M. Chahine)
- AMSR-E conical scanner (JAXA): U. Alabama, Huntsville (R. Spencer) & JAXA
- CERES: NASA LaRC (B. Wielicki)

Mission: Enhance understanding of the global water cycle, improve weather forecasting, allow for diurnal observations (MODIS, CERES), ...



Aqua Instruments Status

- HSB scan motor failure Feb 2003
 - Periodic turn-on tests are performed (next will be #14)
 - No direct impact on standard AIRS sounding products (used in conjunction with AMSU for cloud-clearing)
- All instruments other than HSB functioning nominally
- Data capture rates excellent



Aqua Spacecraft Status

- Mission Director: Bill Guit, GSFC ESMO
- Only a few minor spacecraft anomalies, none impacting science
 - Start tracker time tag error s/w patch completed end of January 2005.
- Orbit maneuvers
 - Periodic drag makeup maneuvers (#20), and MODIS lunar calibrations (#27 completed on 3/21)
 - A-train coordination: 7th Inclination Adjust Maneuver in October 2004, next maneuver not expected until fall 2007
 - PARASOL successfully placed into a final orbit ~2 min behind Aqua in early February



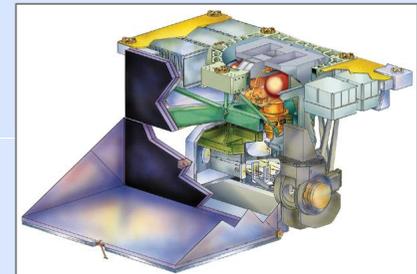
Aqua Spacecraft Status, cont.

- Data downlink via primary ground stations at Poker Flats, AK and Svalbard, Norway
 - Backup via antenna at NOAA Gilmore Creek, AK facility (1 antenna currently certified, 2 awaiting certification)
- Direct Broadcast X-Band for all instruments, operating nominally
- Orbital debris
 - Limited debris screening by DOD Cheyenne Mountain began in January (3 days a week) for Aqua, Aura, and PARASOL. Eventually transition to daily screening.
 - Debris encounters with Aqua and/or Aura of about a half kilometer appear to be “routine”
 - Will develop debris avoidance maneuver capability
- Close coordination of Aqua, Aura, and other A-train mission operations



AIRS/AMSU(A1,A2) Data Status

- Primary standard products: temperature & moisture profiles, TPW, cloud-cleared radiances, cloud properties, SST
- V3 processing available for entire mission: profiles validated over the ocean (1K in 1km, 15% RH in 2 km layers) as well as TPW and cloud-cleared radiances
- V4.0 Data Processing
 - Version 4.0 software delivered to Goddard DAAC, public release should begin by end of March
 - Temperature, water vapor now validated over land
- L3 products to be released in 2005
- All data processed and archived at Goddard DAAC
- NOAA/NESDIS “bent pipe” system at Goddard DAAC → NWP centers
- DB L1B software delivered to U. Wisconsin CIMSS for inclusion into IMAPP (L2 V4 delivery forthcoming)



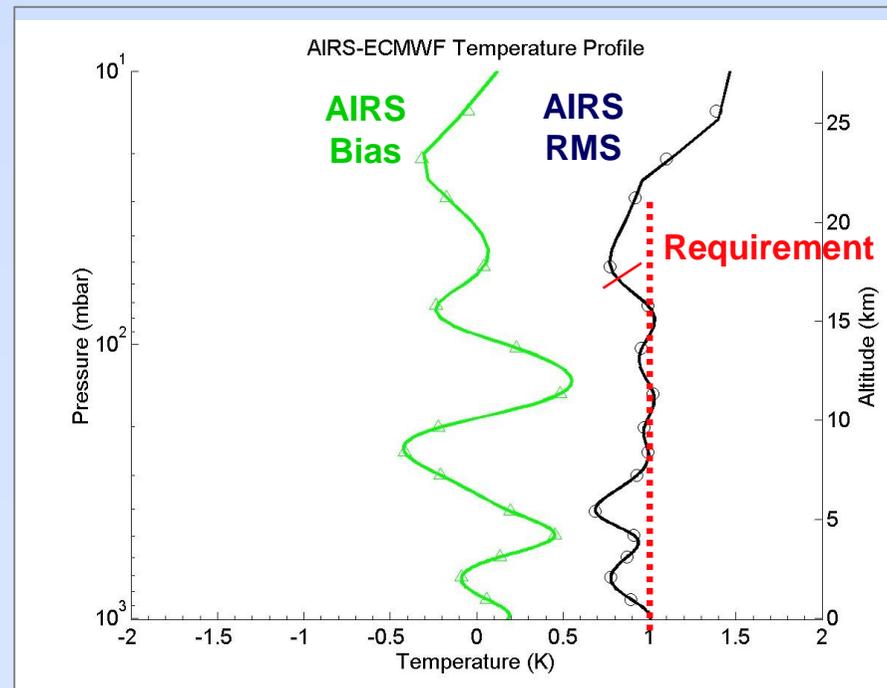
AIRS Science

- IR absolute radiometry (0.2 K) and stability meeting spec
- AIRS data being made available to weather forecast centers: NCEP, UK Met Office, ECMWF, GMAO, Joint Center for Satellite Data Assimilation (JCSDA), et al.
 - Data used operationally at ECMWF, UK Met; experimental at NCEP, GMAO
- *JGR* special issue papers in process of being submitted, ~23-24 papers
- Research products
 - CO retrievals (W. McMillan, publication accepted)
 - O₃ (day & night) compares well with daytime TOMS
 - CH₄, CO₂, SO₂
 - Aerosols
 - Land surface spectral emissivity
- MODIS being used for cloud validation, AMSR-E for water vapor
- 12 continuing science team members, 11 new members



AIRS Temperature Profiles

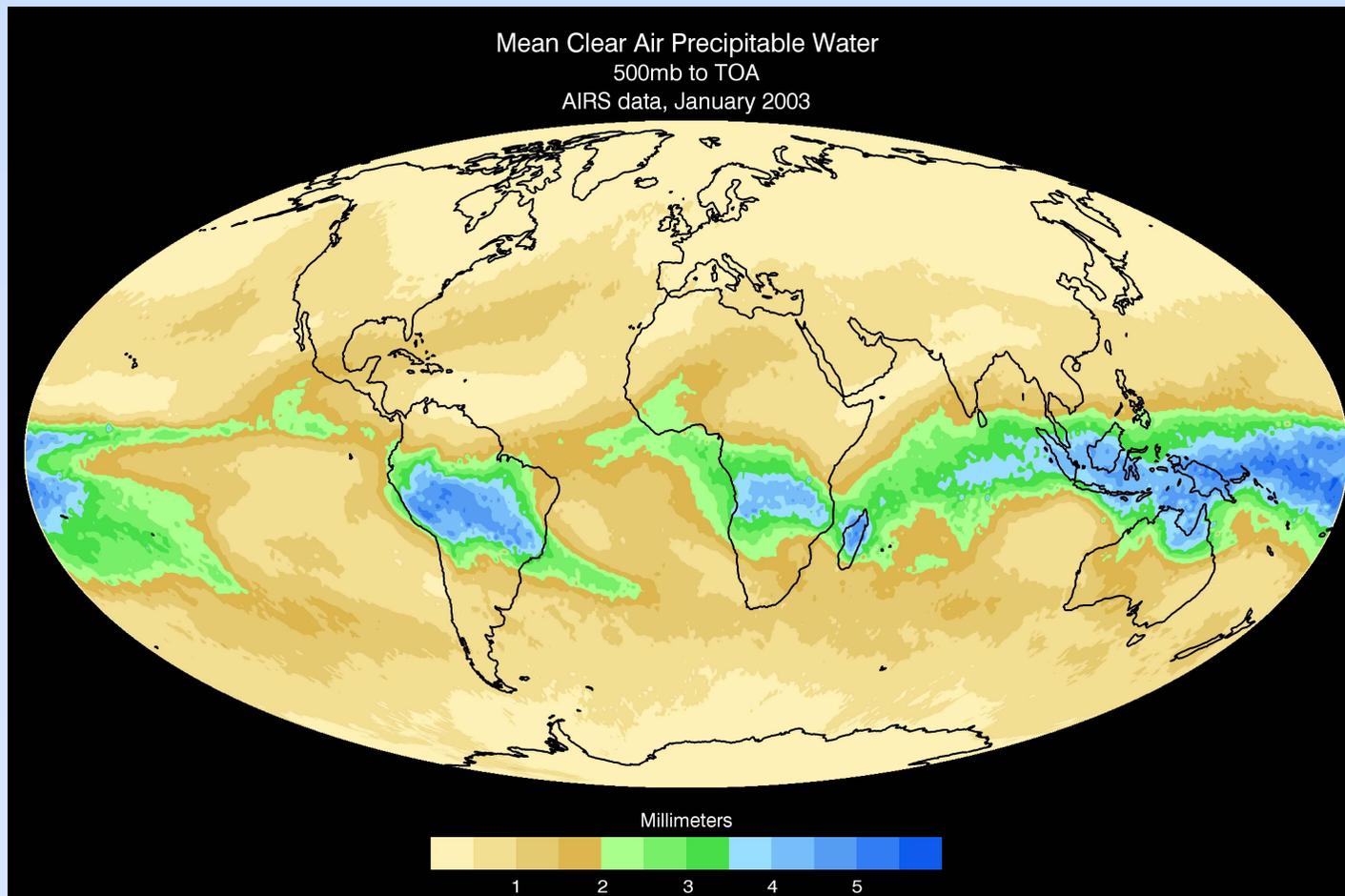
Temperature Profiles Statistics vs. ECMWF
Mid-latitude Ocean
1K/km accuracy to 30 mb



(courtesy G. Aumann, et al.)



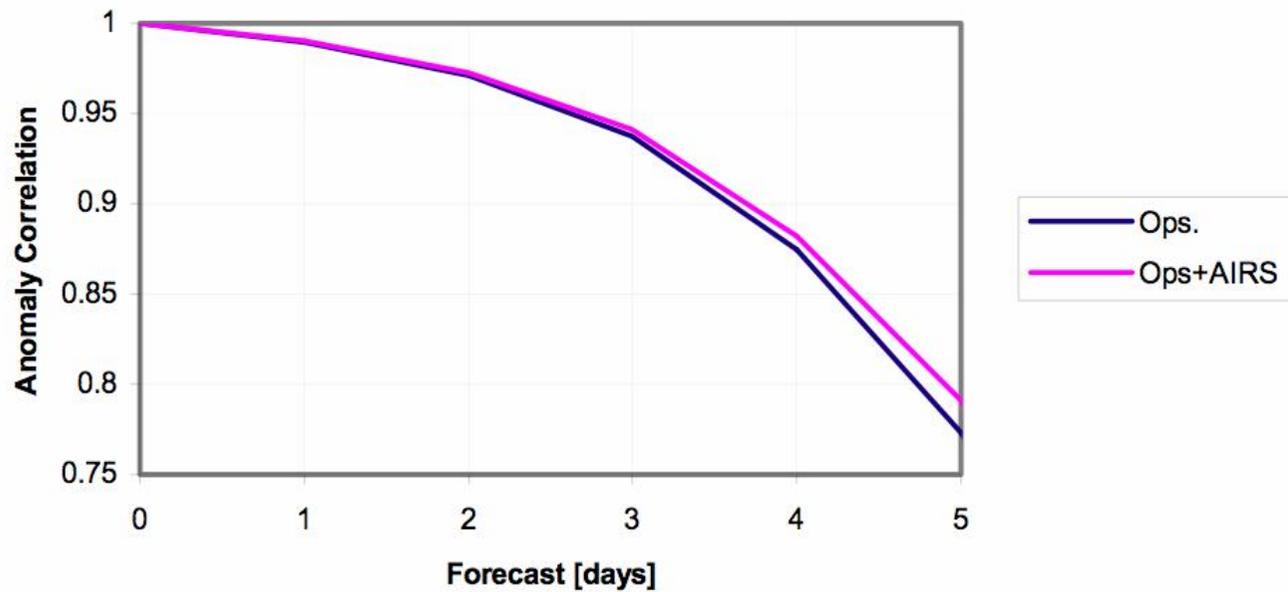
Upper Tropospheric Water Vapor January 2003



(courtesy T. Pagano, et al.)



S. Hemisphere 500mb AC Z 20S - 80S Waves 1-20 1 Jan - 31 Jan '04



AMSR-E Data Status



- Standard products:
 - ocean products (SST, sfc wind speed, water vapor, cloud water path), rainfall products (instantaneous, monthly), snow water equivalent, sea ice products (ice concentration, temperature, snow depth over ice), surface soil moisture
- L1A produced by JAXA, new version in Feb 2005
- Data Processing at SIPS in Huntsville
 - First major reprocessing completed in Oct 2004
 - Next reprocessing after testing with new L1A version, beginning in June
 - Archived at NSIDC DAAC
- JAXA algorithms/products archived in Japan
- Arrangement to allow the US team to process ADEOS-II AMSR data has just been signed; products will be archived at NSIDC
- DB L1 software package from RSS available via Wisconsin/CIMSS (public release forthcoming)



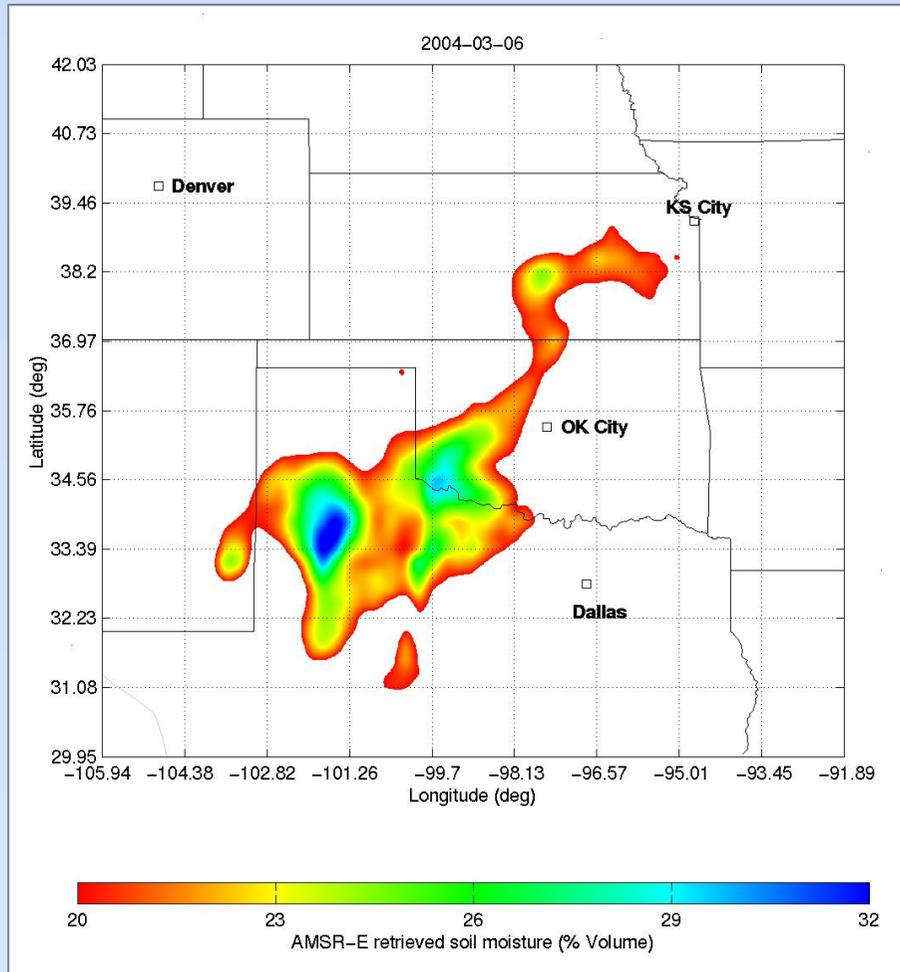
AMSR-E Science

- Validation activities:
 - 2003 “Golden Year”: Precip. campaign in Japan, Snow in Colorado, Sea Ice in the Arctic, Soil Moisture Experiment (SMEX) in Iowa and Brazil, Antarctic Sea Ice campaign called off due to Aircraft problems
 - 2004: SMEX in Georgia, Alabama and Oklahoma, Antarctic Sea Ice campaign based out of Ushuaia, Argentina
 - 2006 planned: Arctic Sea Ice and Snow in Alaska
- Science highlights:
 - Calibration has been made independent of SSM/I and TMI data
 - All algorithms have been updated in preparation for the next data reprocessing (removal of small biases from the ocean algorithm, using only the N2 sea ice algorithm, correct sea ice flag and use only working 89GHz channel data in the precip algorithm, etc.)



Soil Moisture Data to Study Extent of March 2004 Flood

JPL/NSIDC (Eni Njoku), <http://nsidc.org/data/amsr/okflood/>



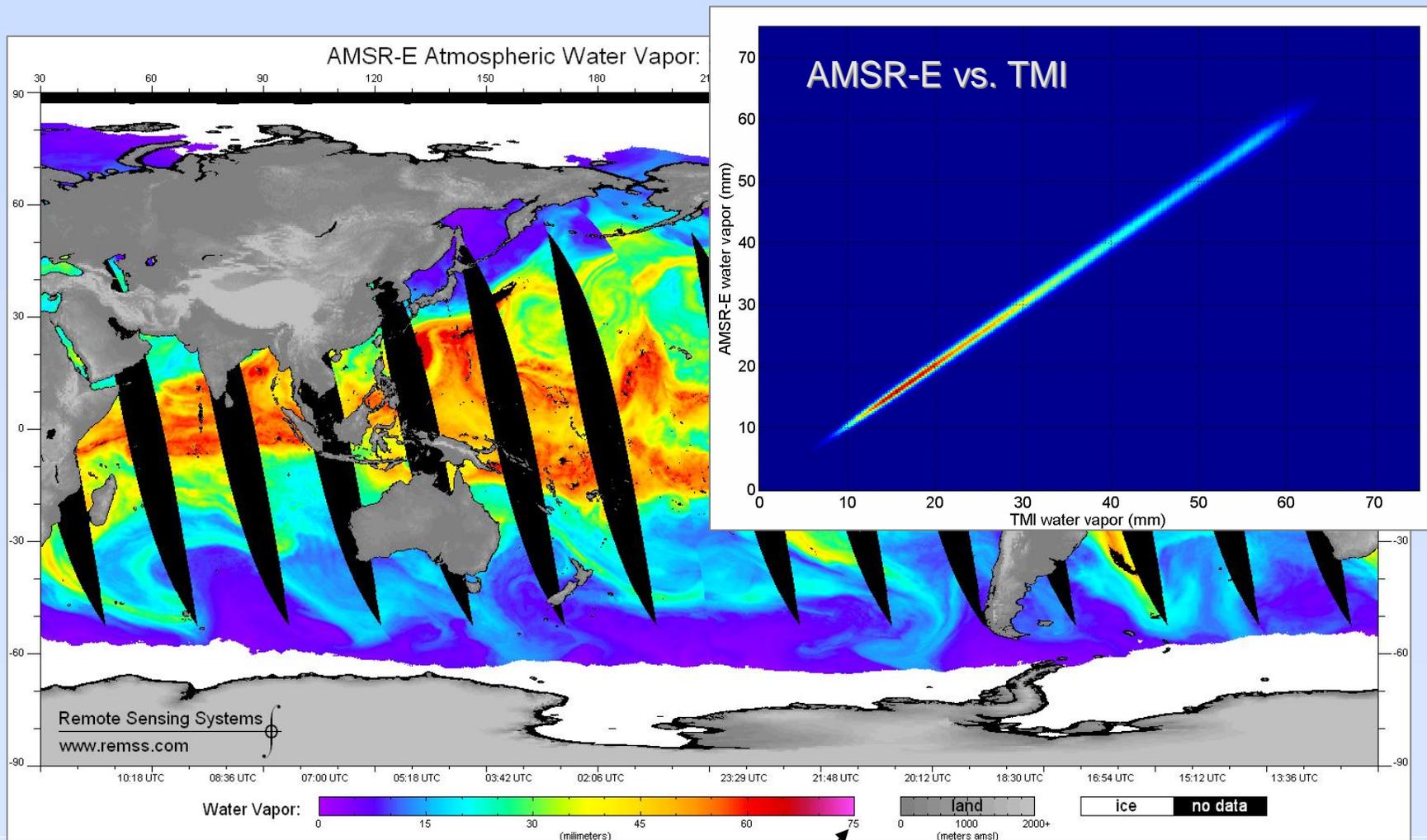
Fast-moving line of thunderstorms in early March 2004 stretched from central Kansas to northern Texas (photo above)

Elevated soil moisture, 20-32% inc by vol
6 March 2004



Example Column Water Vapor Retrievals

F. Wentz, RSS

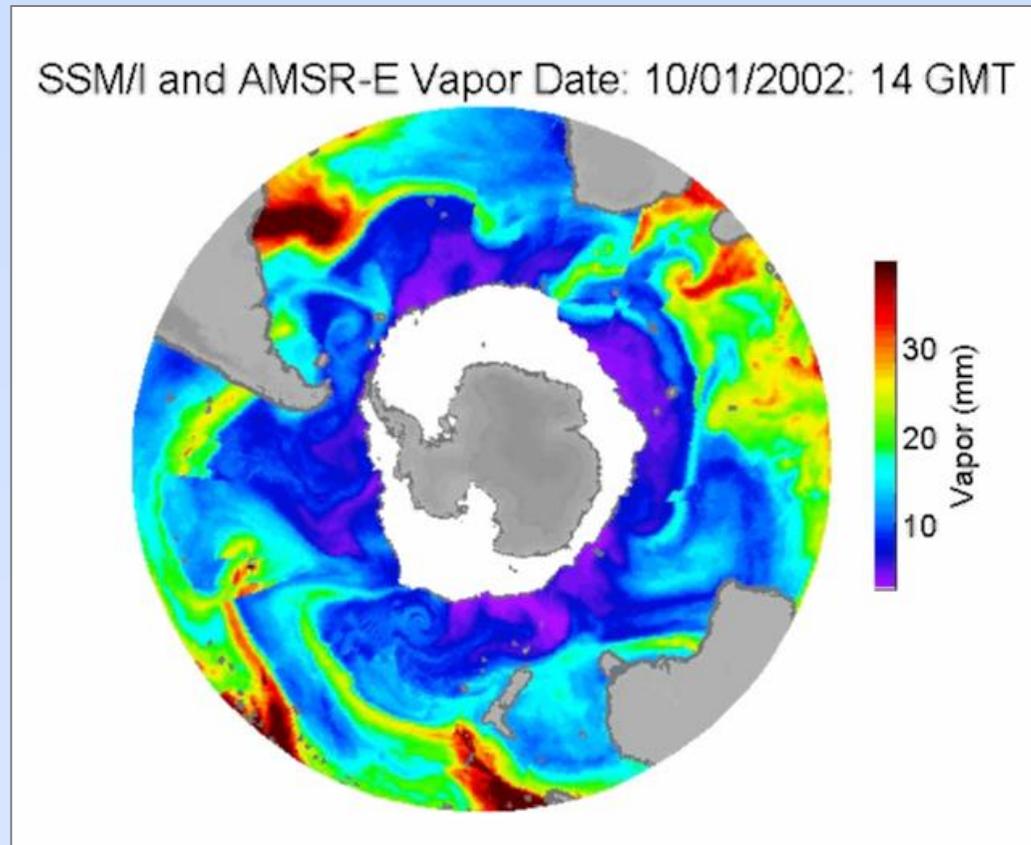


7.5 cm



Polar Water Vapor: merging of AMSR-E & 3 SSM/I

F. Wentz, RSS



CERES Aqua Data Status

- Primary standard products: broadband shortwave, broadband longwave, & IR window radiances; TOA & surface radiative fluxes; integrated cloud properties
- Aqua Processing
 - L1B Edition 1 radiances completed through 12-31-04
 - L1B and ERBE-like Edition 2 radiances and fluxes through 7-04
 - Edition 2 SSF merged CERES/MODIS through 6-04, now have 2 years of data to start on Aqua Angular Distribution Models (ADM)
 - L3: once ADMs are complete and all GEO data are acquired
- All data archived at LaRC DAAC
- No funding for DB s/w modification, little value in instantaneous data from a climate instrument



CERES Science recent investigations

- Global ocean heat storage program and ERBS/CERES global net fluxes found to agree to within 0.3 Wm^{-2} for 1992-2002, paper in draft form
- Investigation of “Earthshine” albedo study (6 Wm^{-2} increase in shortwave flux 2000-2003) vs. CERES (2 Wm^{-2} decrease) accepted by *Science*
- Working with climate modeling community
- Major participant in GEWEX International Radiative Flux Assessment
- Further CERES science efforts in Norm Loeb’s talk (Wed. morning plenary session)

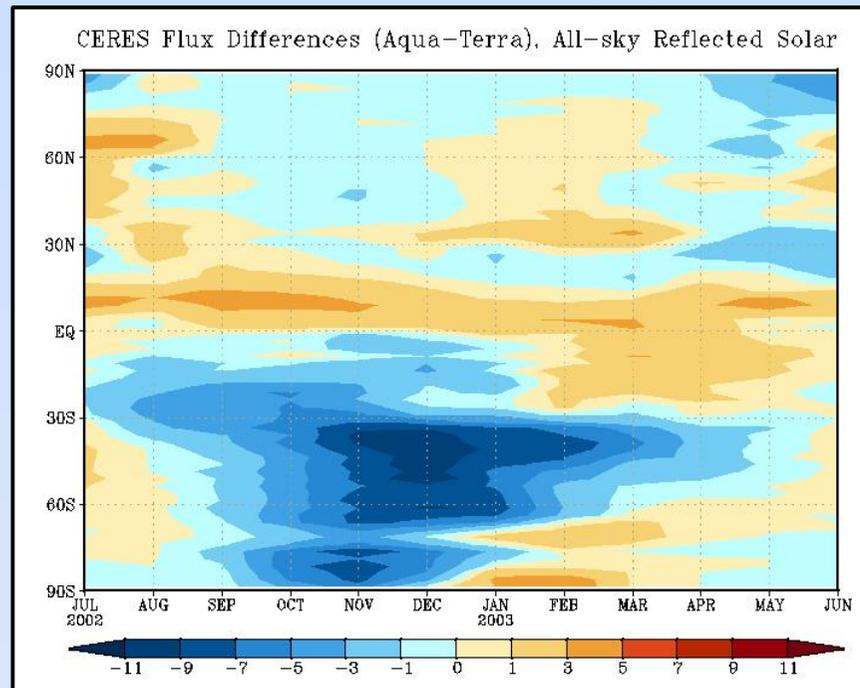


Aqua CERES Science Result

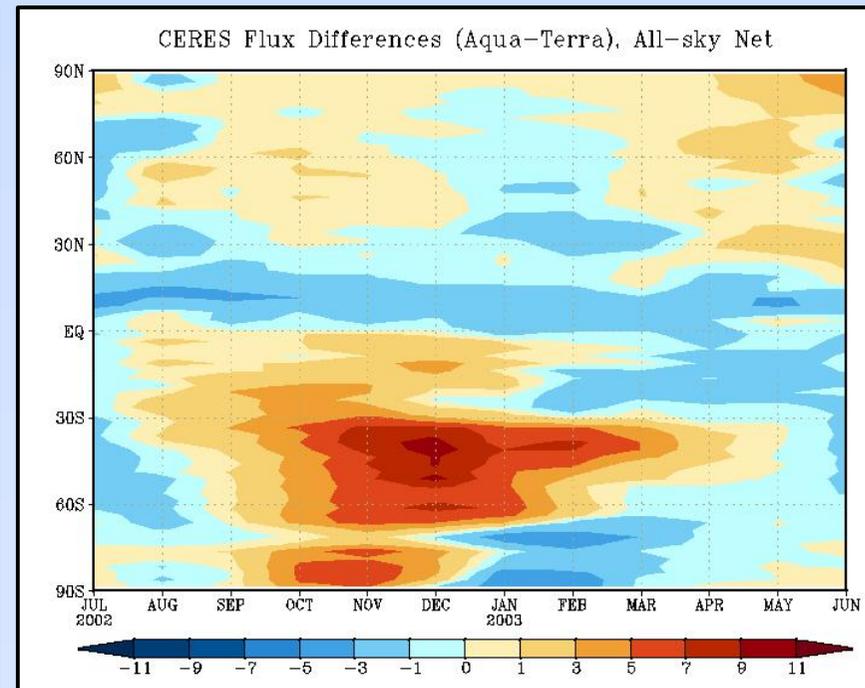
Effects of diurnal cloud cycle on TOA fluxes, Jul 2002 - Jun 2003

Tak Wang and Norm Loeb, LaRC

Shortwave flux difference (Aqua-Terra)



Net flux difference (Aqua-Terra)



Flux differences greatest over the summertime Southern Oceans due to higher solar insolation and larger separation in satellite local sampling time => optically thinner clouds in this region for Aqua afternoon orbit



Summary

- Spacecraft and instruments (other than HSB) operating nominally
- Close coordination with other afternoon constellation platforms
- Periodic Aqua Science Working Group Meetings to encourage inter-instrument science communication and collaborations
 - Most recently October 2004 (w/focus on retrievals of cloud water path, cloud-top properties, and water vapor)



500 mb CO concentration, 22-23 Sept 2002
W. McMillan (UMBC)

