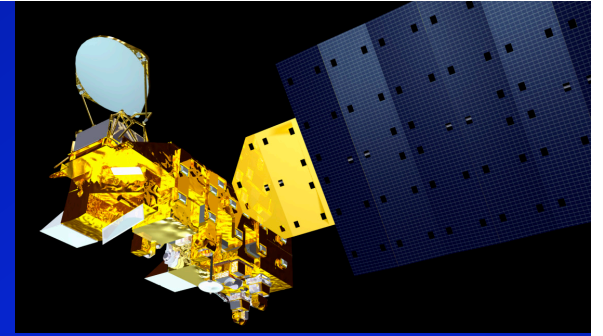




Status of Aqua



Claire L. Parkinson
Aqua Project Scientist
NASA Goddard Space Flight Center

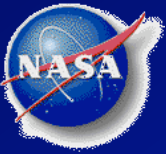
Presentation at the AIRS Science Team Meeting,
Greenbelt, MD, October 14, 2008



Aqua Hardware Status

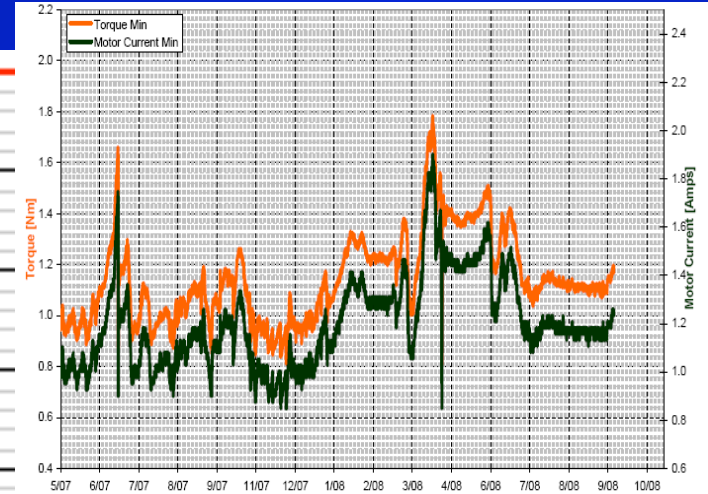
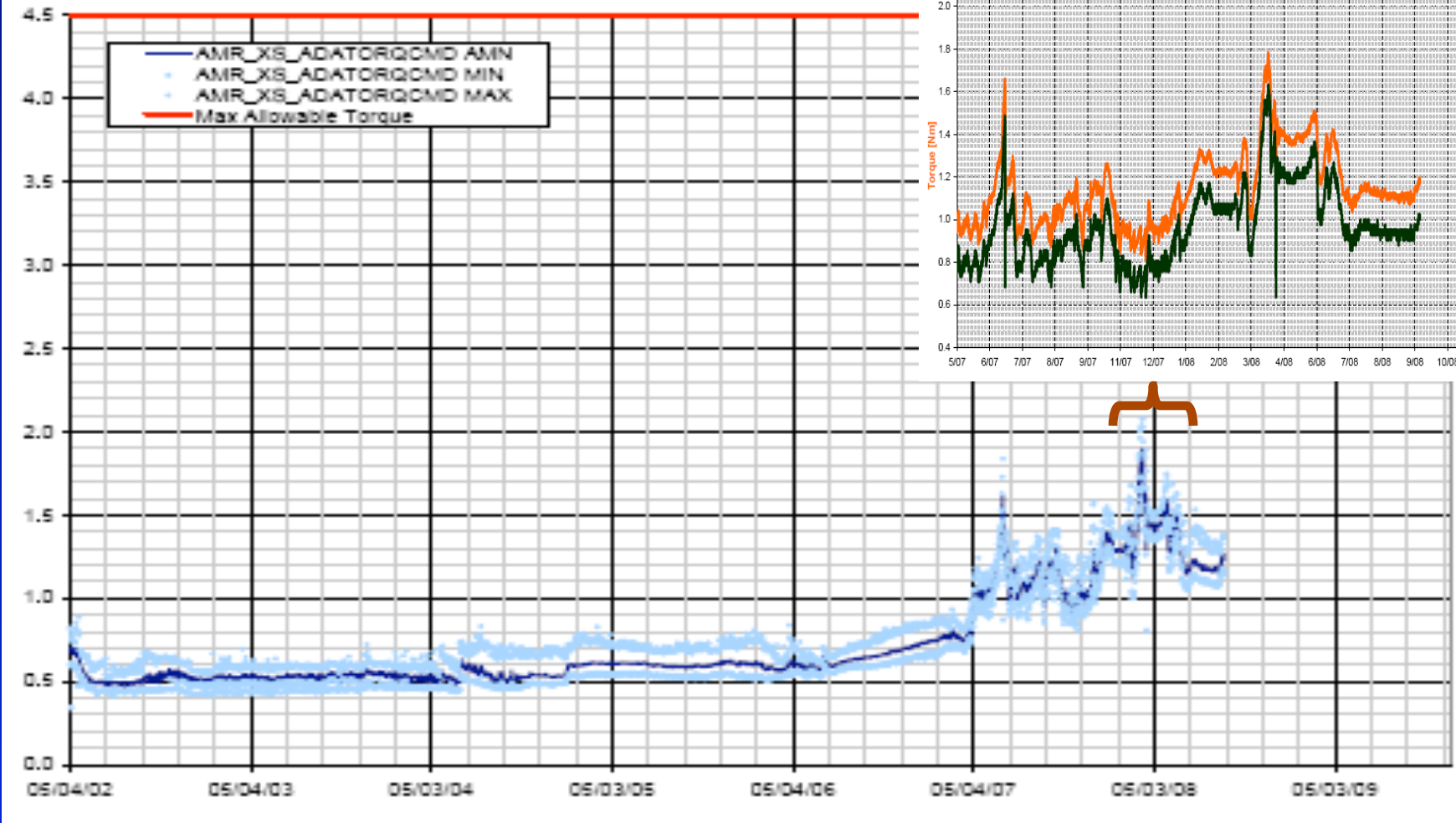


- Spacecraft: Excellent condition, although Partition 6 of the Solid State Recorder requires a reconfiguration eventually.
- AIRS: Excellent condition, performing superbly.
- AMSU-A: Still functioning well except for degradation in channels 4, 5, and 7.
- HSB: Inoperative (8-9 months of good data; survival mode since 2/5/03).
- AMSR-E: Excellent condition except for the 89 GHz channel using the A feedhorn and worrisome increases in the Antenna Drive Electronics motor current and torque and the Antenna Drive Assembly temperature.
- CERES (two sensors): FM3 is in excellent condition; the shortwave channel of FM4 failed as of 3/30/05.
- MODIS: Excellent condition except for band 6 (most band 6 detectors are non-functional).



AMSR-E Antenna Drive Electronics (ADE) Motor Current and Torque Progression

AMSR-E ADE Torque (Nm)

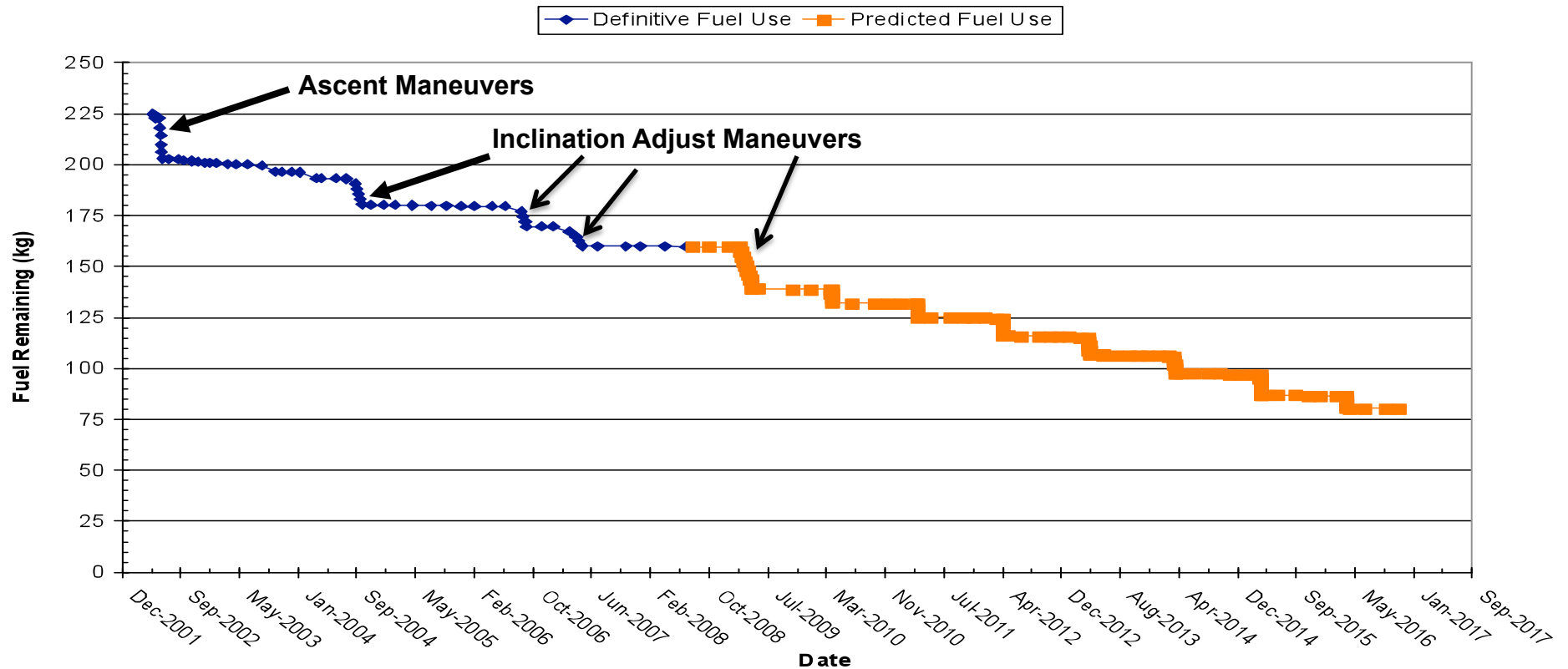


Time: Launch (May 4, 2002) through September 2008



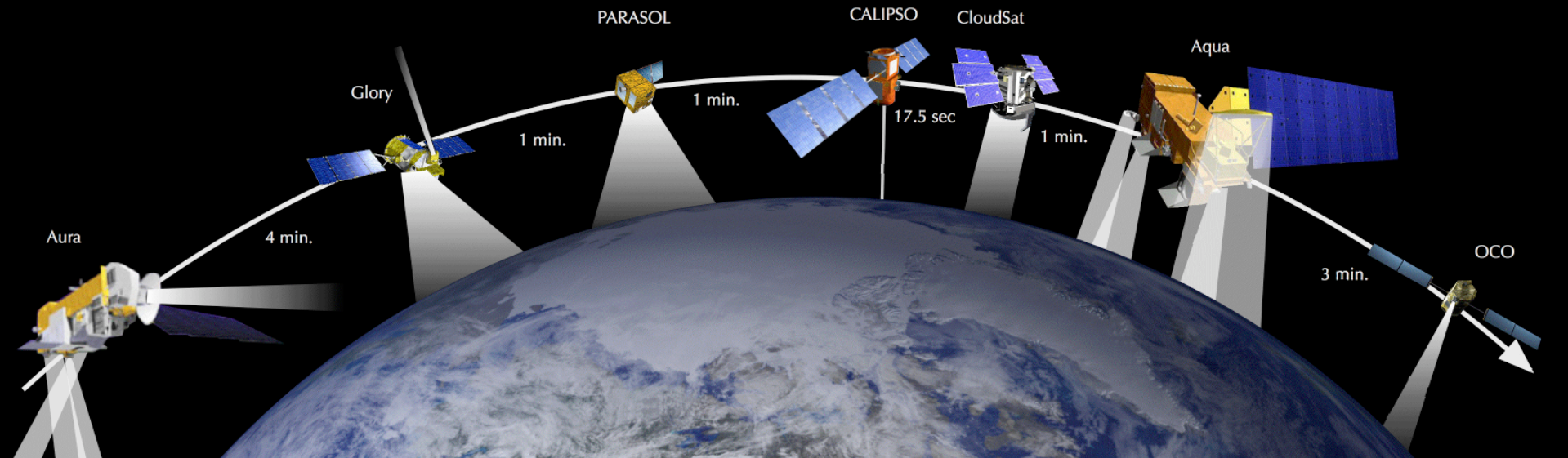
Revised Aqua Lifetime Estimate

- The Flight Dynamics Team has updated their estimates of expected fuel usage through 2017.
- Result: Aqua appears to have enough fuel to last at least through 2016 and perhaps through 2020, still with fuel available for the necessary end-of-mission maneuvers.



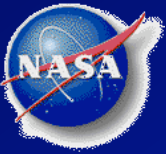


A-Train Status



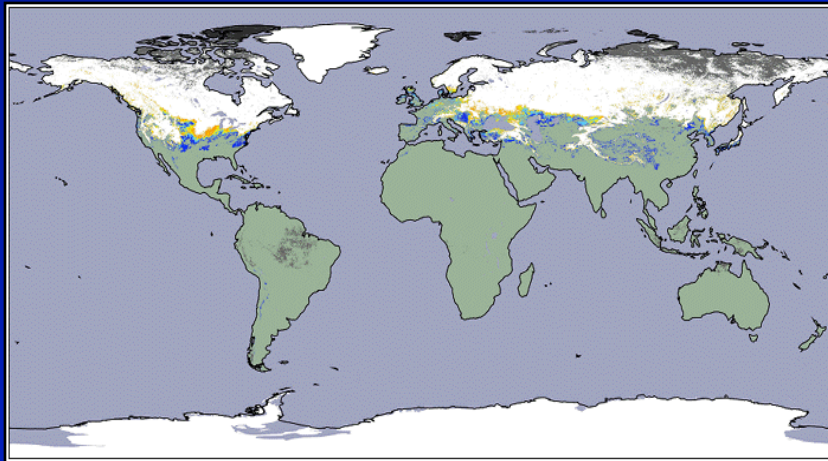
- Successful CloudSat maneuver on 10/2/08 leaves CloudSat 124.1 km (16.54 seconds) ahead of CALIPSO and approaching CALIPSO at about 1.1 km/day (0.15 seconds/day).
- Orbiting Carbon Observatory (OCO) scheduled to launch 1/15/09, to be positioned in front of Aqua.
- Glory scheduled to launch 6/15/09, to be positioned between PARASOL and Aura.
- Some possibility that the Japanese Global Change Observation Mission – Water (GCOM-W) will join the A-Train in 2013 or later.

Next 7 Slides: A Selection of Science Results
from Aqua's Other (non-AIRS) Science Teams



Sample MODIS and AMSR-E Snow Products (intra-Aqua comparisons)

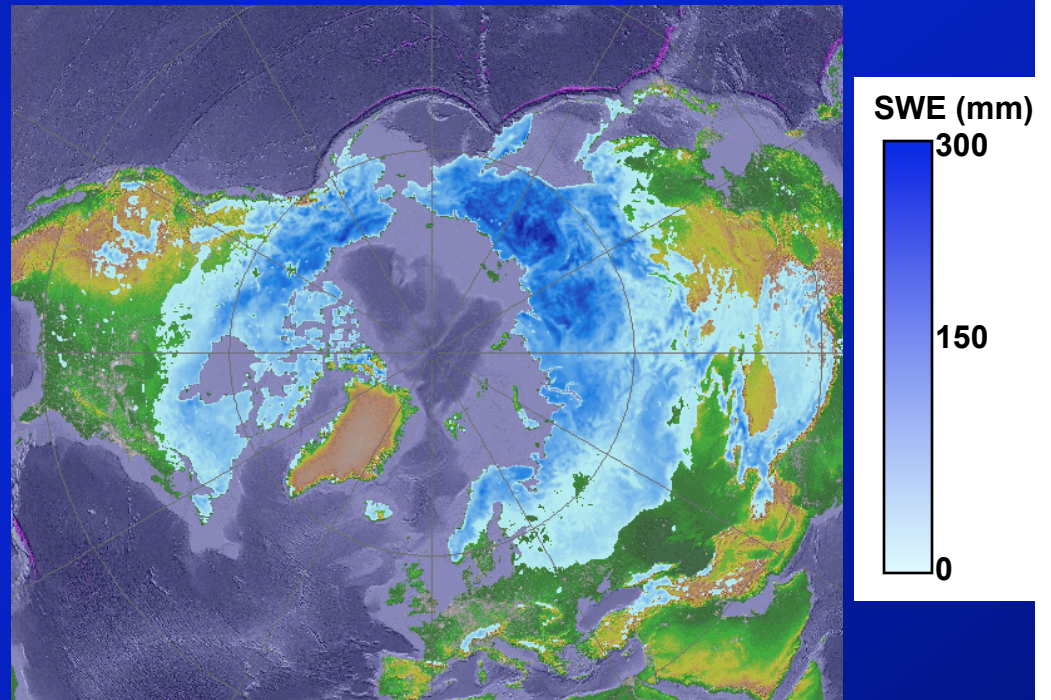
MODIS 8-day composite 5-km
resolution snow map,
February 24 – March 2, 2004



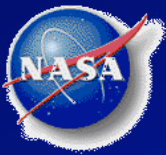
1-19% 20-39% 40-59% 60-79% 80-100% no decision

Percent snow cover

Sample wintertime AMSR-E snow
water equivalent (SWE) map

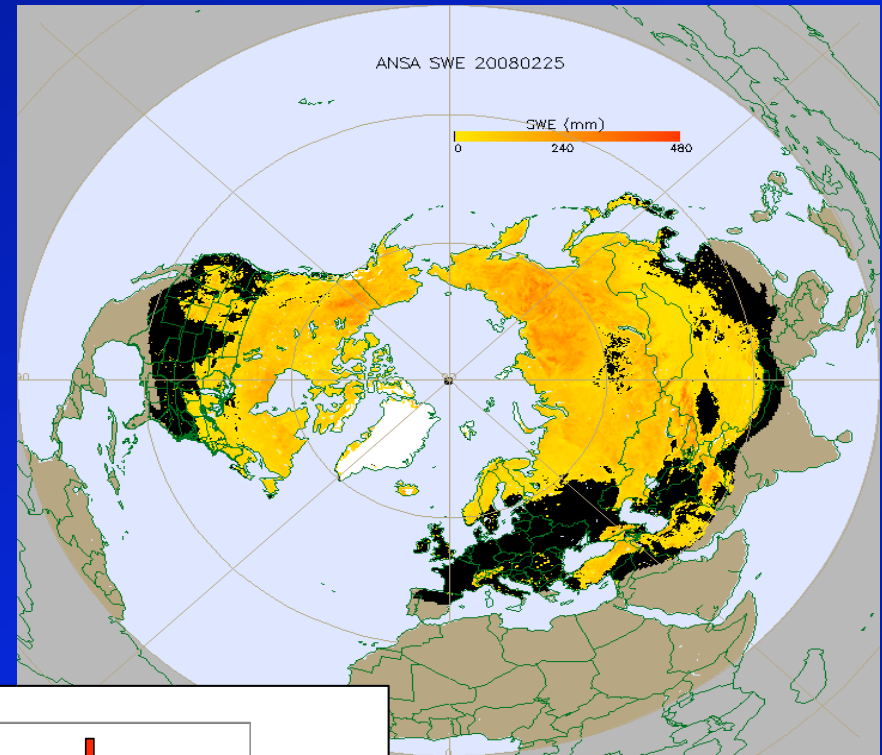


Images from Dorothy Hall and Jim Foster



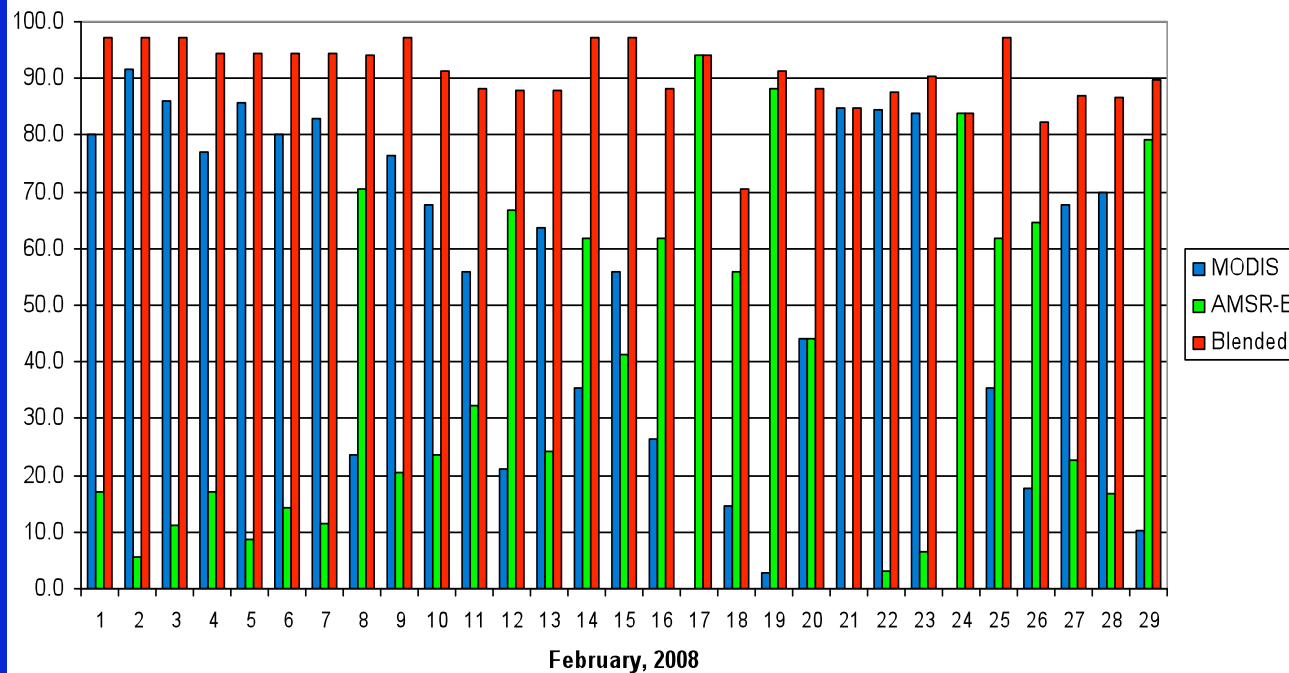
Blended AMSR-E/MODIS Snow Product

- Air Force – NASA Snow Algorithm (ANSA) blended product
 - High-resolution MODIS data
 - All-weather AMSR-E data
- Improved snow water equivalent (SWE) and snow extent products

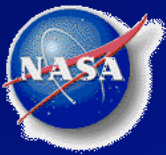


Sample blended SWE image for 2/25/08 (from Jim Foster and Dorothy Hall)

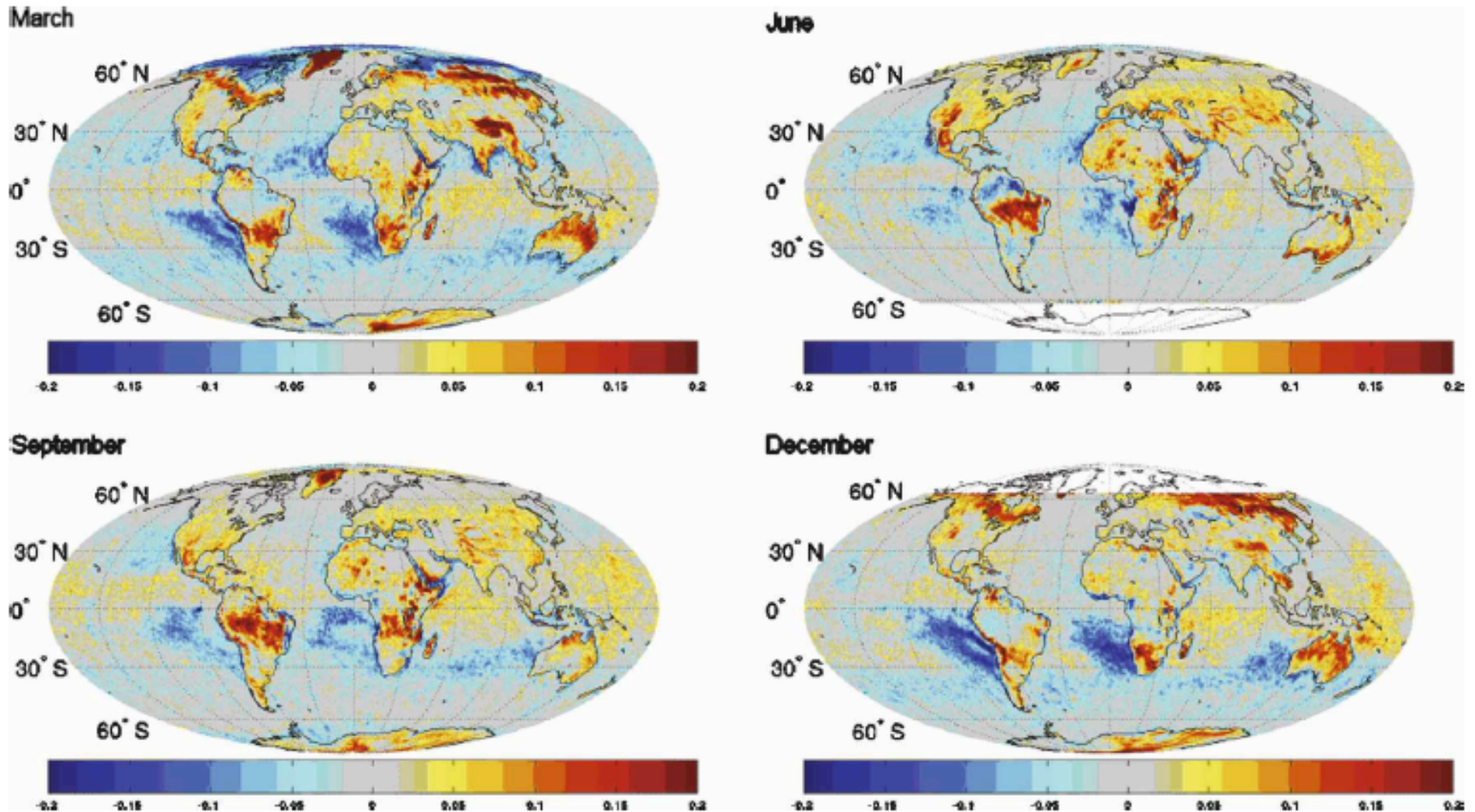
Blue & red bars: % agreement with ground data
Green bar: % additional information



Sample validation results for snow extent from eastern Turkey (from Zuhal Akyurek and Dorothy Hall)



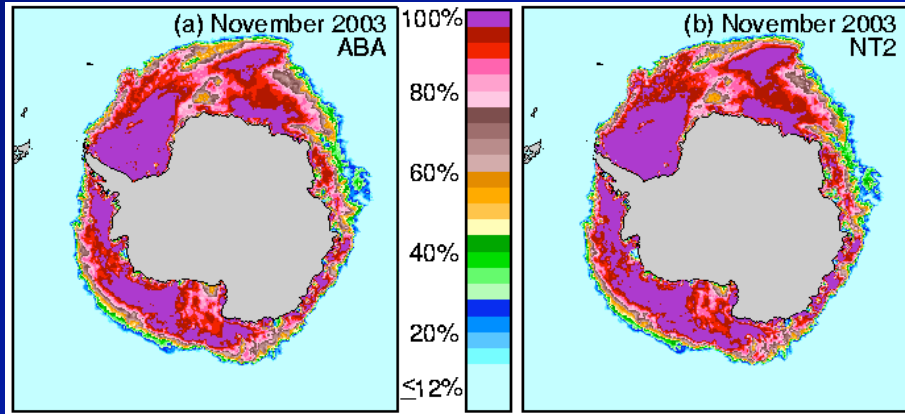
MODIS Cloud Cover, Aqua vs. Terra



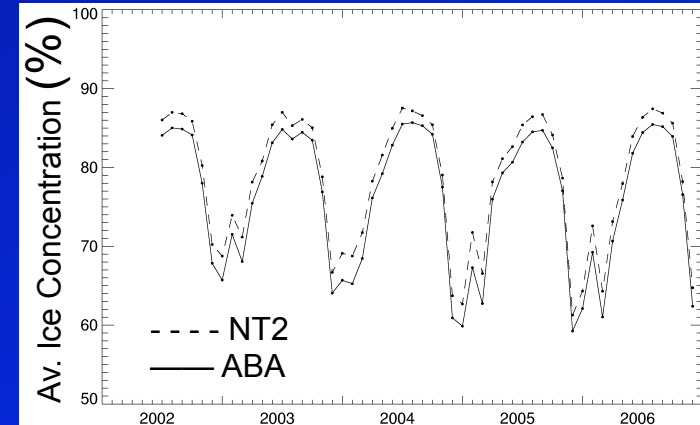
MODIS Aqua minus Terra monthly mean daytime cloud fraction averaged over the 5-year period August 2002 – July 2007 (from Steve Ackerman et al., *J. Atmos. Oceanic Technology*, 2008)



Antarctic Sea Ice from Two AMSR-E Algorithms and one SSMI Algorithm

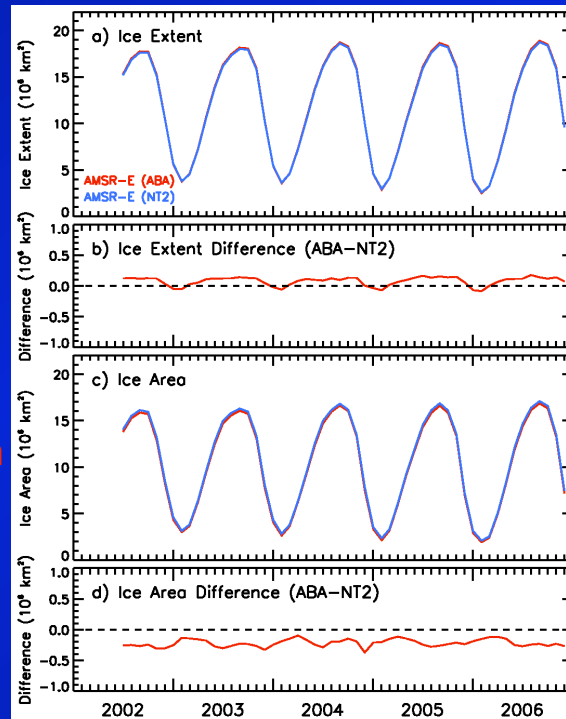


Sample ABA and NT2 sea ice concentrations



Average ice concentrations

Time series of ice extents and ice areas



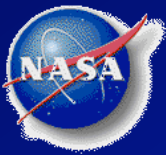
Algorithms:
 ABA – AMSR-E bootstrap
 SBA – SSMI bootstrap
 NT2 – AMSR-E NASA team

Illustrations from Parkinson and Comiso (2008, *JGR*)

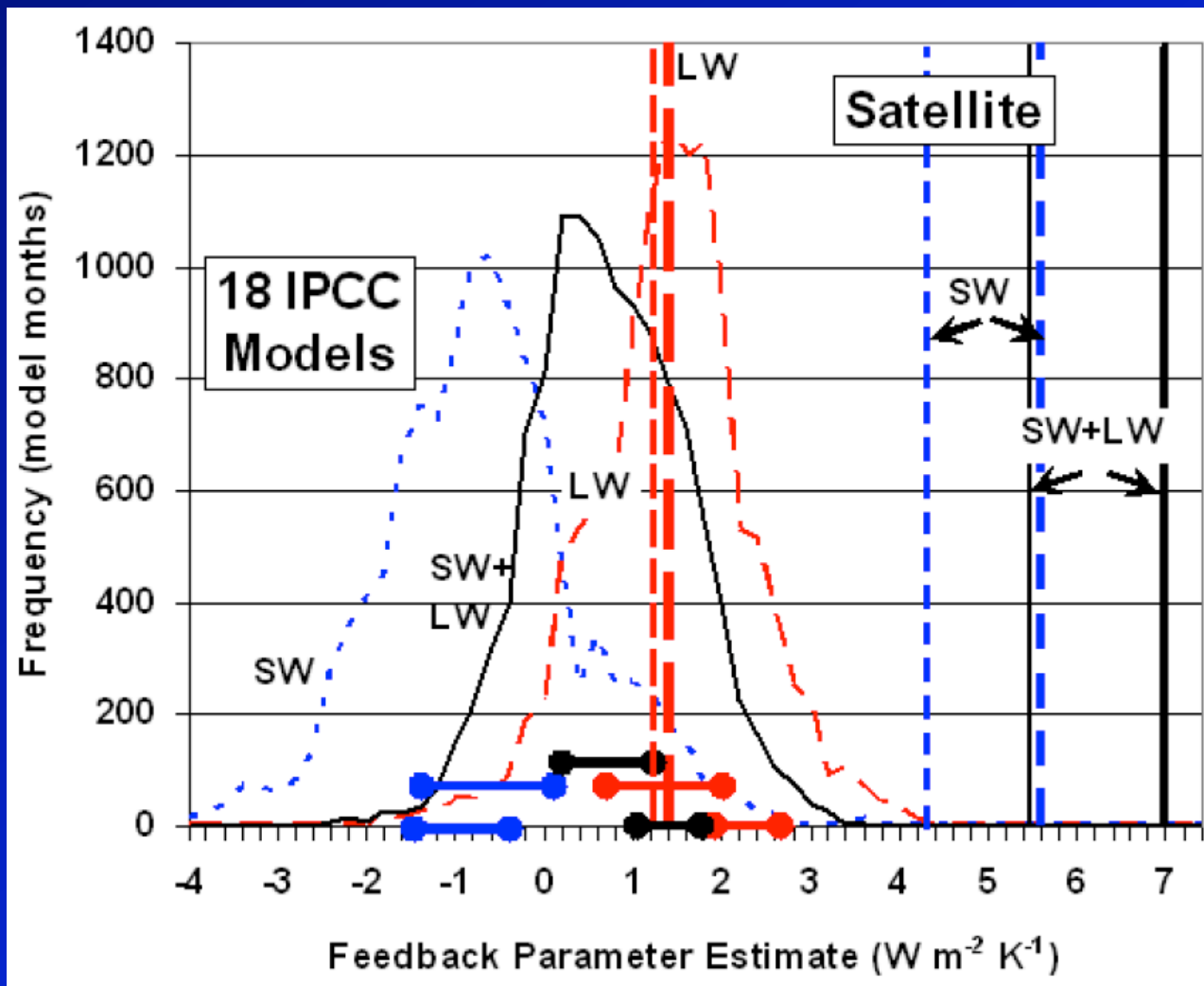
Algorithm	Ice Extent Trend
ABA	- 65,000 ± 46,000 km ² /yr
SBA	- 68,000 ± 46,000 km ² /yr
NT2	- 67,000 ± 45,000 km ² /yr

Algorithm	Ice Area Trend
ABA	- 78,000 ± 41,000 km ² /yr
SBA	- 75,000 ± 41,000 km ² /yr
NT2	- 86,000 ± 42,000 km ² /yr

Table. Anomaly Trends, 7/02 - 12/06



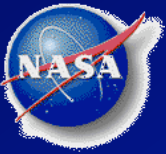
Comparison of Climate Feedbacks from Models versus AMSR-E and CERES Data



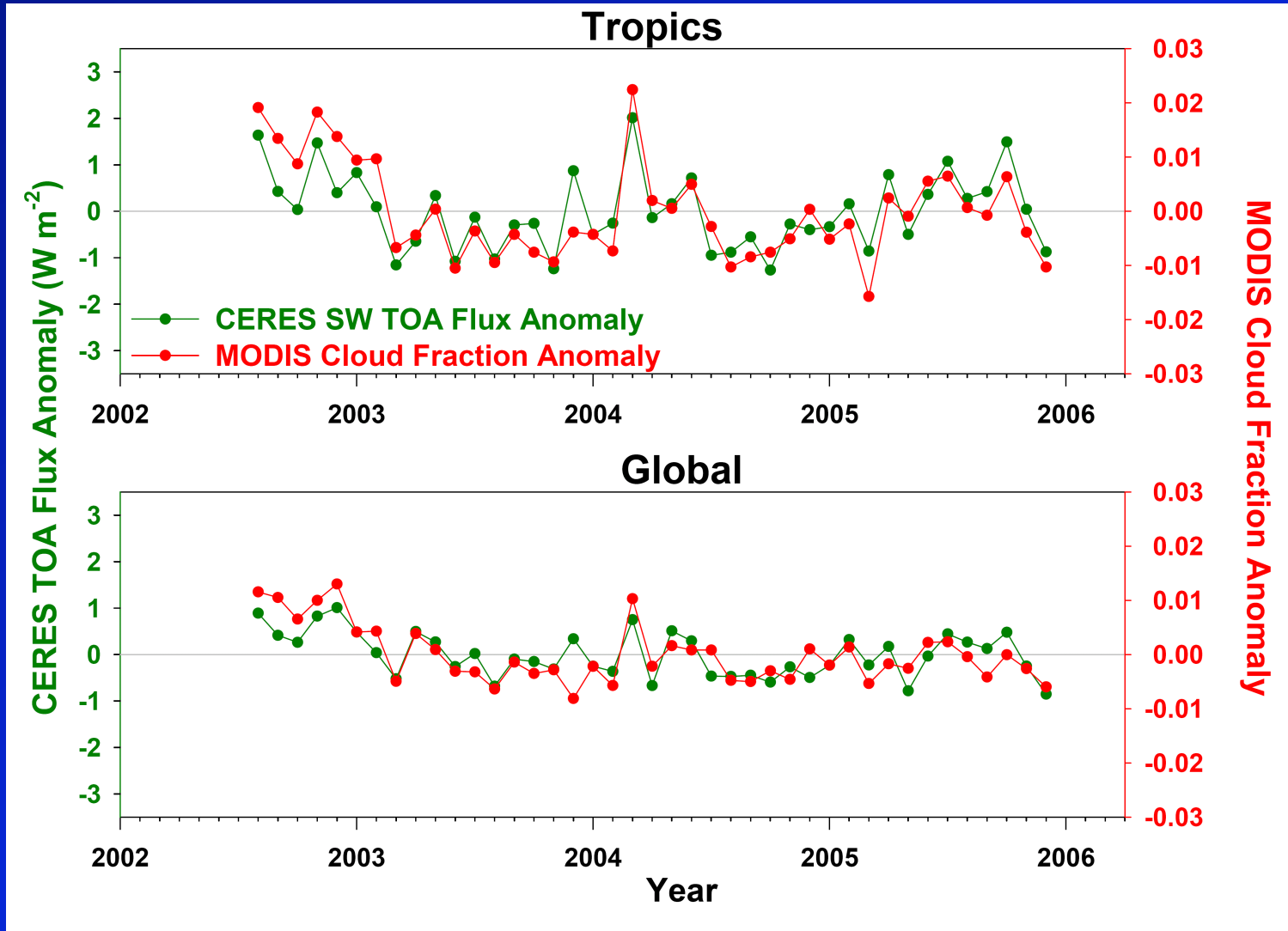
Note: Great match between satellite and model results for the LW feedback, but not for the SW feedback.

Key message: The models are not properly simulating the SW feedback.

From Roy Spencer and William Braswell (2008, submitted)



Sample Aqua Data Intercomparison for Climate Studies: CERES Shortwave TOA Flux versus MODIS Cloud Fraction

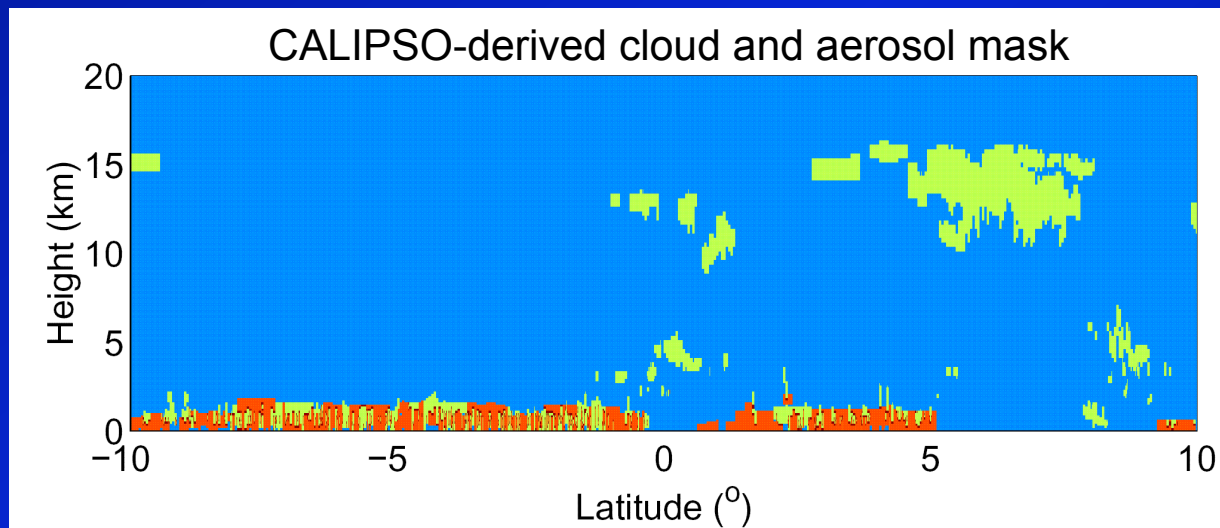
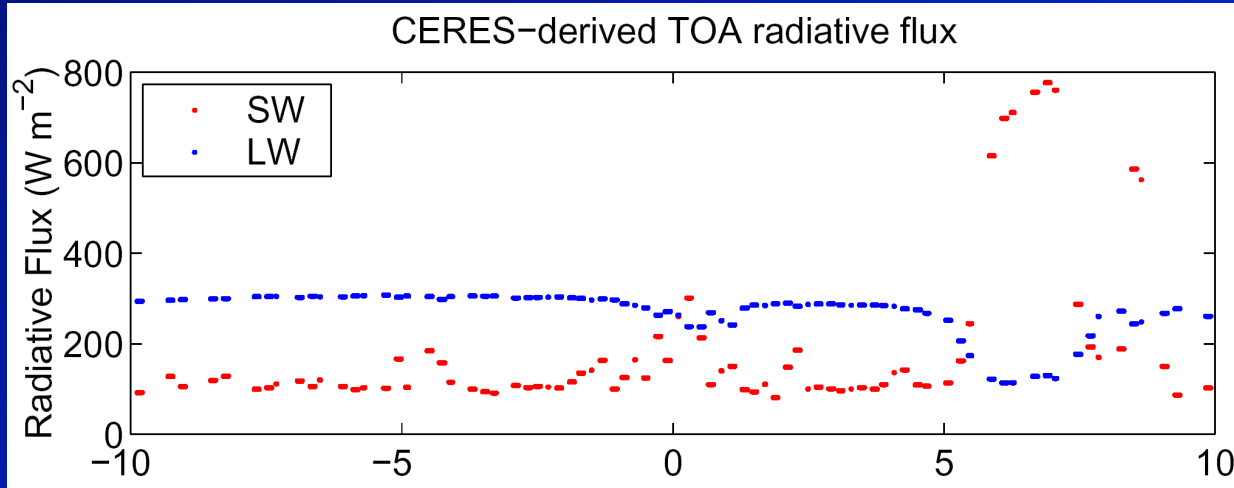


From Norman Loeb and Bruce Wielicki, CERES Science Team

TOA = Top of Atmosphere



Sample A-Train Data Fusion Efforts



 Cloud layers

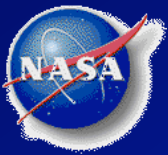
 Aerosol layers

Eventually will include:

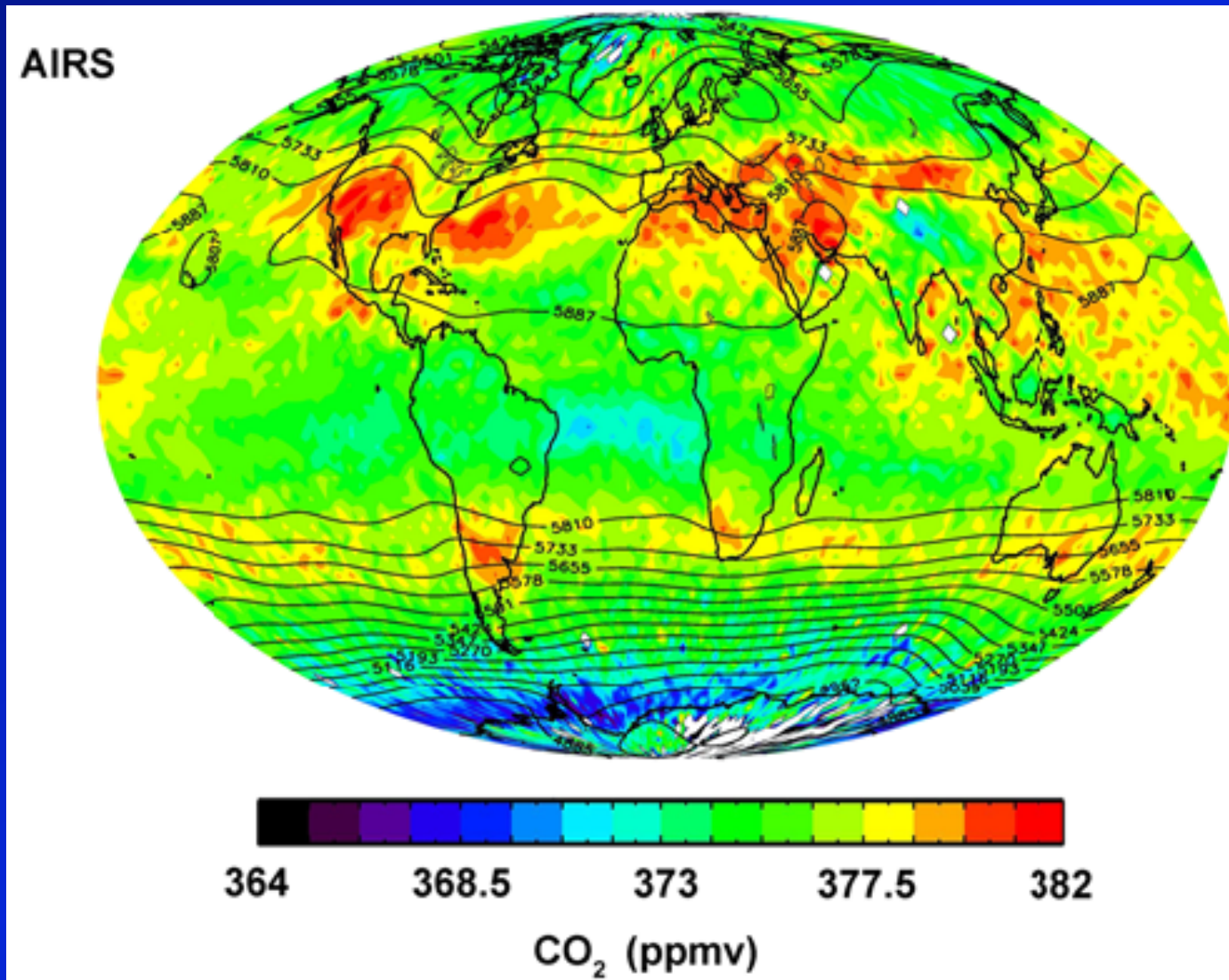
- (1) cloud overlap profiles from CALIPSO and CloudSat,
- (2) Cloud and aerosol properties from CALIPSO, CloudSat, and MODIS,
- (3) TOA radiative fluxes from CERES.

Goal: Improved radiative flux profiles.

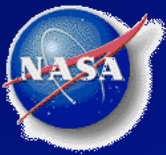
From Norman Loeb and Bruce Wielicki, CERES Science Team



July 2003 Mid-Tropospheric CO₂ from AIRS



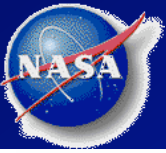
From Mous Chahine et al. (2008, *GRL*)



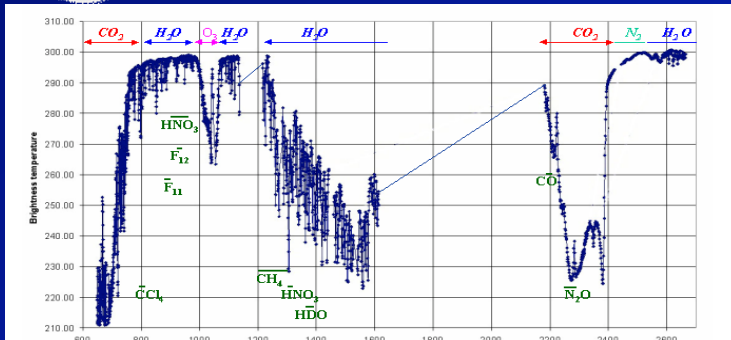
Upcoming Reviews

- Aqua End-of-Prime-Mission (EOPM) Review.
 - Scheduled for December 2-3, 2008.
 - Focused on lessons learned and how NASA can improve future missions.
 - Sample topics to include:
 - Instrument performance
 - Performance versus expectations
 - Data handling
 - Data flow to users
 - Cal/val, including an accounting of where the data products are with respect to validation
 - An accounting of any research products that have essentially become standard products
 - Interactions (among Aqua teams, with the rest of the A-Train, between centers, agencies, and countries)
 - Possible improvements in the management of the mission or the science
- 2009 Senior Review
 - Suggested revised scope being considered by HQ
 - Perhaps less all-encompassing than the 2007 Senior Review
 - Perhaps more oriented to science, data, and mission ops.
 - Do the data products address NASA objectives?
 - Are the products produced efficiently?
 - Are the products being used and by whom?
 - Expect the call for proposals in December 2008.
 - Proposals due in March 2009.
 - Review panel to meet in late April 2009.
 - Expect 3 review panels, for science, EPO, and Core mission.



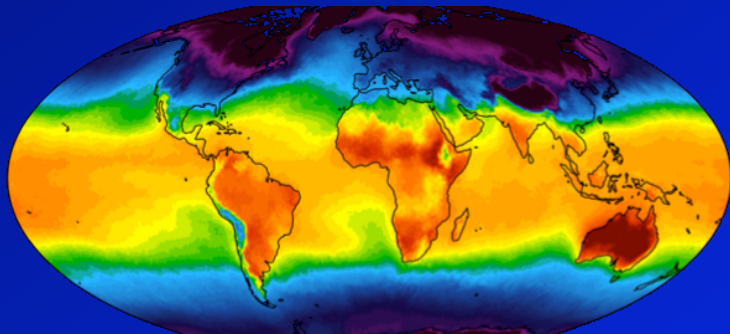
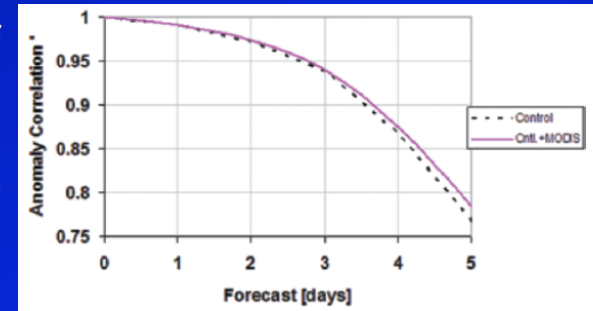


Aqua Products Supporting Weather Forecasting



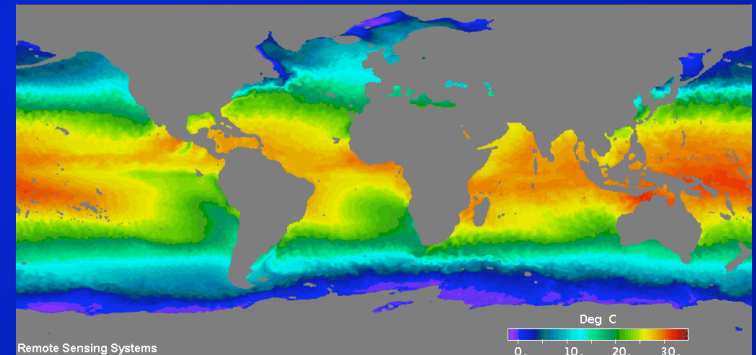
AIRS
radiance
spectra

Impact of
MODIS
polar winds
on weather
forecasts



AIRS/AMSU sfc air temps (Jan. 2003)

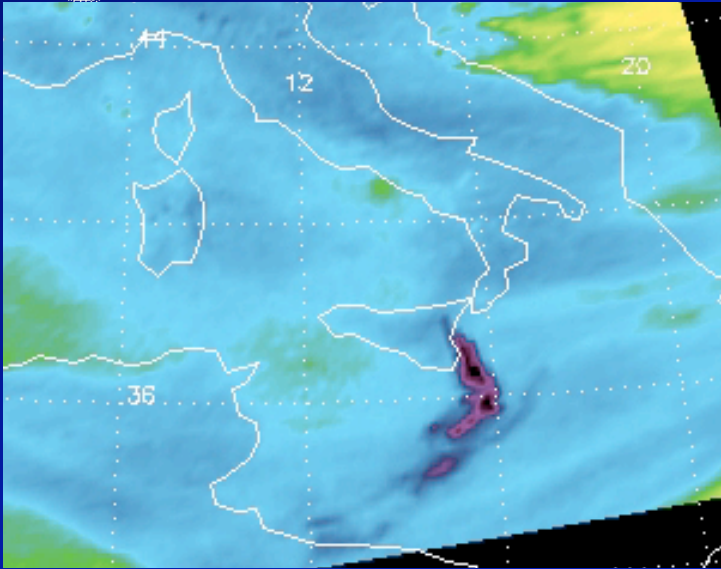
AMSR-E
SSTs
(Dec.
2003)



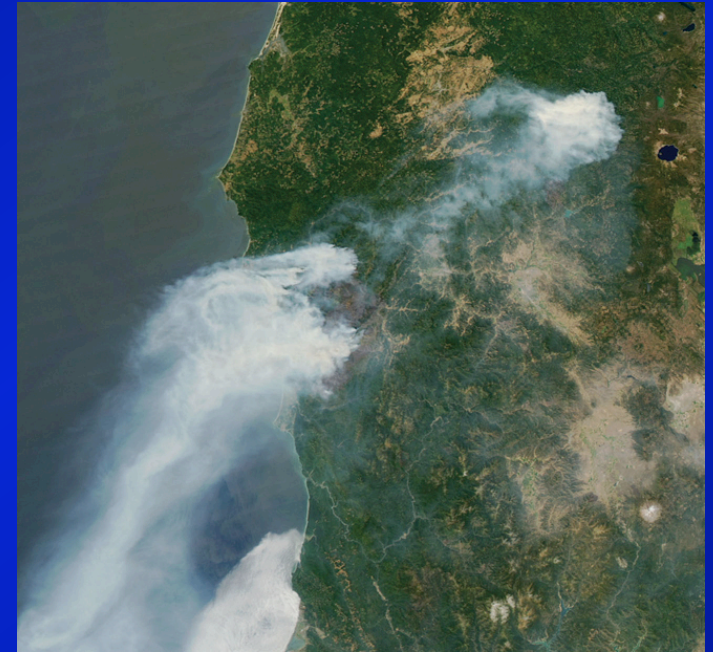
- NOAA NCEP, ECMWF, and the UK Met Office use AIRS/AMSU temperature and radiance data.
- The National Hurricane Center uses AMSR-E rainfall and brightness temperatures.
- The U.S. Navy, UK Met Office, Australian Bureau of Meteorology, and the Japan Fisheries Information Service Center use AMSR-E SSTs.
- The Japan Meteorological Agency uses AMSR-E water vapor and precipitation data.
- At least 10 numerical weather prediction centers use MODIS polar winds.



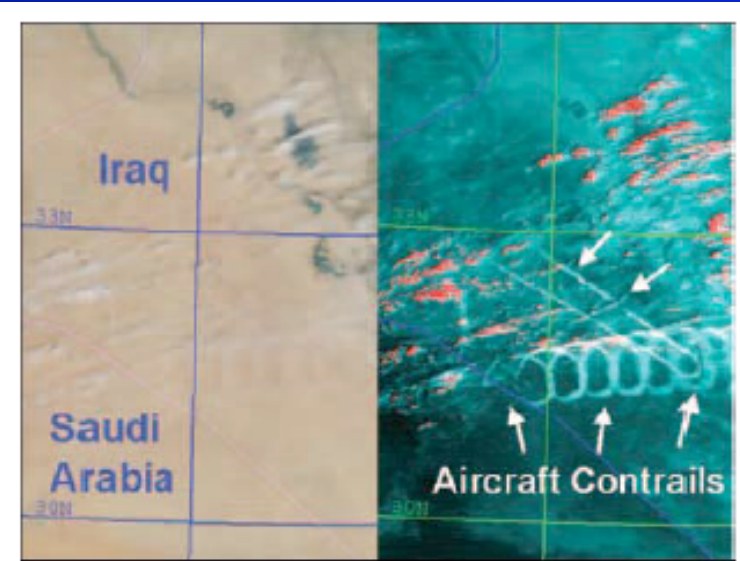
Aqua Products Supporting Other Applications



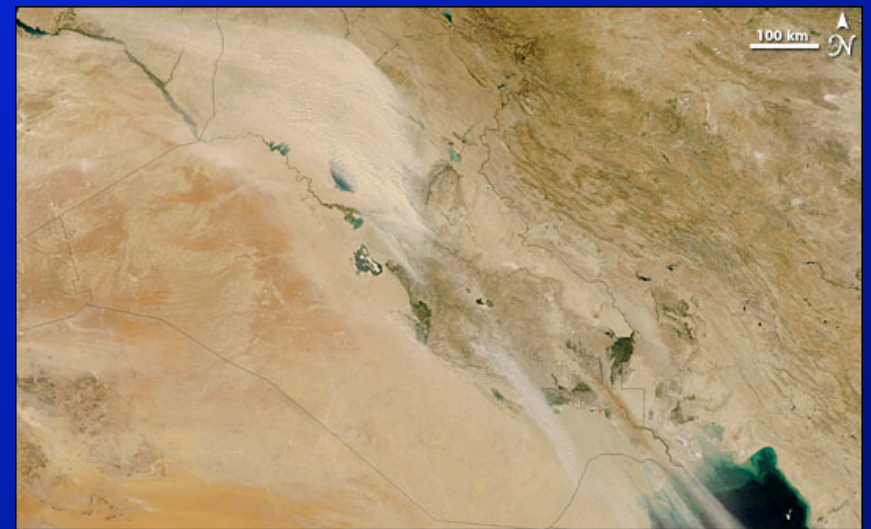
Oregon Fires,
8/12/02, from
MODIS



Volcanic SO₂
plume, 10/28/02,
from AIRS



MODIS contrail detection reveals
flight patterns of aircraft over Iraq



Dust storm in Iraq, 8/7/05, from MODIS

