AIRS Science Survey

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AIRS SCIENCE DATA PRODUCTS

"Infrared Remote sensing through clouds"

Core Products: ***Global, Day- Night, Lands-Oceans***

Infrared cloud-cleared Spectrum (Radiances)

Atmospheric temperature profiles - 1C/1km
Sea surface temperature: 0.5C
Land surface temperature: 1C
infrared emissivity ratio
Relative humidity profiles: 20%/1 km
total perceptible water vapor: 5%
Fractional cloud cover 0.05
cloud-top pressure and temperature
cloud spectral infrared emissivity ratio
Total ozone burden of the atmosphere

Research Products:

Total CO2 burden of the atmosphere
CO, CH4, others
Precipitation rates
Etc.

How is the "competition doing?

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	AIRS Papers
SPIE Conference in San Diego July 2003	8
COSPAR Conference in Toulouse, August 2003	2
SPIE Conference in Barcelona September 2003	6
Eumetsat Conference in Weimar October 2003	2

T(p), q(p) retrievals

SST/marine aerosol

Minor gases

Data Assimilation

T(p) accuracy of 0.5K rms, q(p) 10% accuracy claimed by CRIS for 90% of all retrievals (cloud-clearing)

Level 2 products to be available within 20 minutes after measurements being taken, using a distributed receiving system.

T(p) accuracy of 0.5K rms shown by IASI for cloud-filtered data.

Lots of work going on in making SST measurements.

AMSRE showed two hour time lapse images of SST and precipitation combining DMSP/SSM/I,TRMM/TMI and AMSRE images for showing the progress of a hurricane

GOES provides the global SST every 3 hours, but not very accurate (zero bias relative to Reynolds because of regression)

MSG provides SST with 15 minute refresh (AVHRR split channel approach) .

Effect of marine aerosol at the 0.5K level (0.3K rms) is now increasingly accepted (Chris Merchant, AATSR) (Nalli, AVHRR)

MODIS (P.Minnett) proposal (NRA) to use the MODIS aerosol optical depth product to correct the MODIS SST product for aerosol.absorption

MODIS AMSRE collaboration to fill MODIS sst product cloud holes with AMSRE sst.

Integration of Meteosat6, Meteosat7, GAPS, GOES-E, GOES-W to create global SST

0.3K cold bias correlates with
AVHRR aerosol optical depth

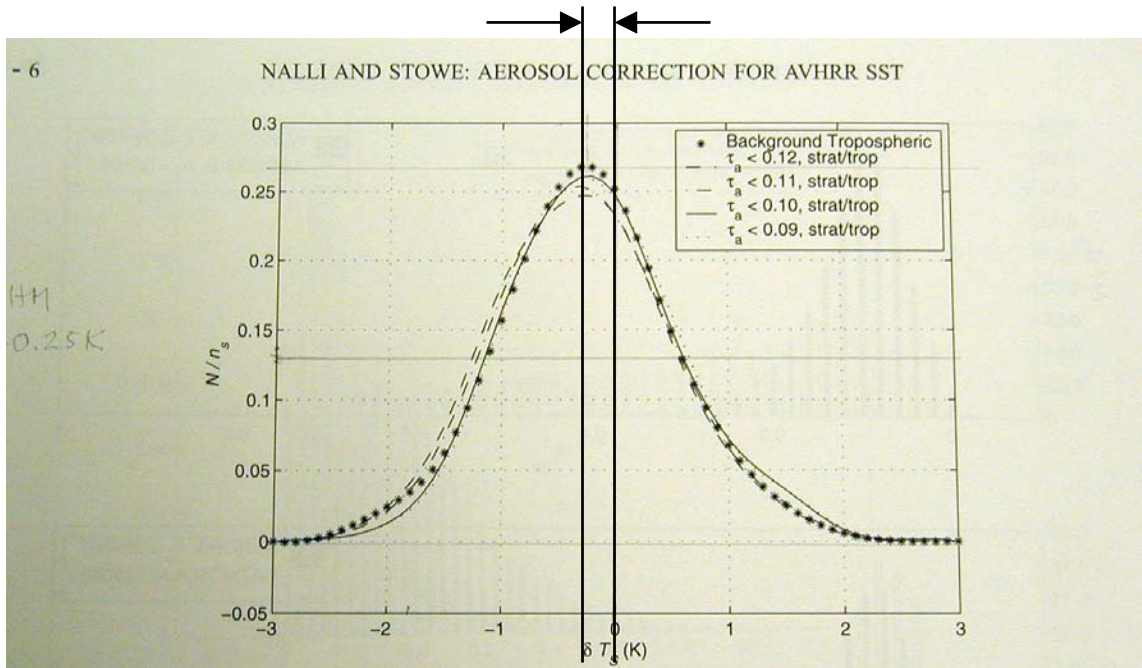


Figure 3. Normalized histograms of MCSST residuals, δT_S, obtained using equation (1) applied to PATMOS-BUOY match-up data under NOAA 11 "background tropospheric" conditions (i.e., $\tau_a < \tau_0^{trop} = 0.15$). Residuals obtained under these conditions are denoted by the asterisks. Residuals obtained under NOAA 11 "background strat/trop" conditions with separation thresholds $\tau_0^{strat} = \{0.12, 0.11, 0.10, 0.09\}$ are shown with lines.

Stowe and Nalli (2002) paper

Ozone retrievals from ADIOS II (polar orbiter)

Ozone retrievals from MSG (geostationary) using
HIRS type approach, assuming T(p), q(p) from ECMWF

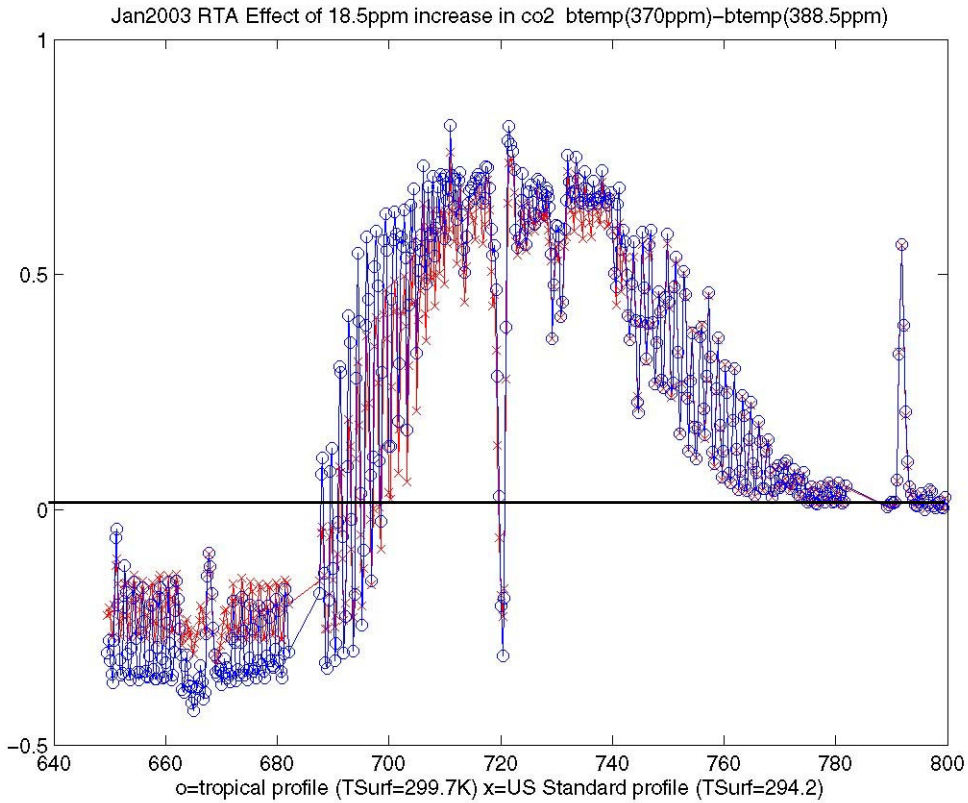
co2 retrievals are a hot topic

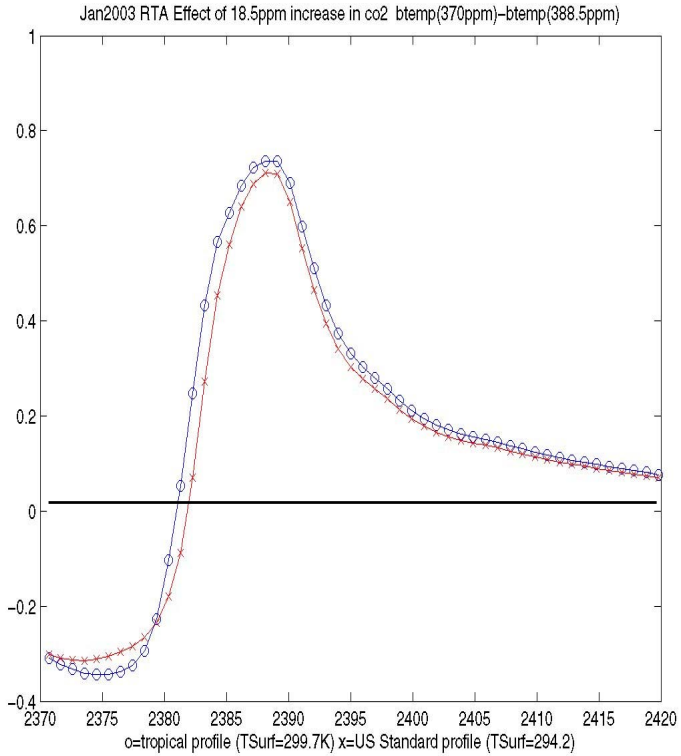
Phil Watts (ECMWF) showed 4DVar assimilation of AIRS for co2 Retrievals

M. Buchwitz and J. Burrows (2003) SCIAMACHY (ENVISAT 10am polar) results with cloud-filtered data from a single orbit

IASI expects 3ppm co2 retrieval accuracy from a single cloud-filtered spectrum based on simulated data

A change in co2 of 18 ppm shifts the AIRS spectra about 0.5K





T(p), q(p) sensitivity in the 14um band

Cloud and cirrus residuals

T(p) sensitivity in the 4.3um band

cloud residuals

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M. Buchwitz and J. Burrows (2003) SCIAMACHY (ENVISAT 10am polar) results with cloud-filtered data from a single orbit

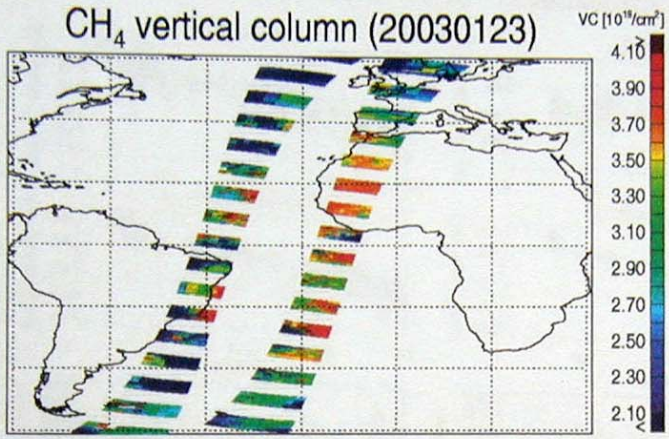

Fig. 12. As Fig. 11 but for CH_4 (window WIN_CH_8a).

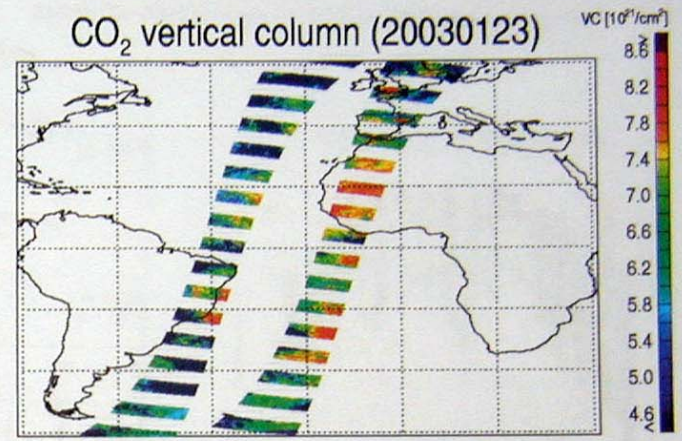

Fig. 13. As Fig. 11 but for CO_2 (window WIN_CH_6).

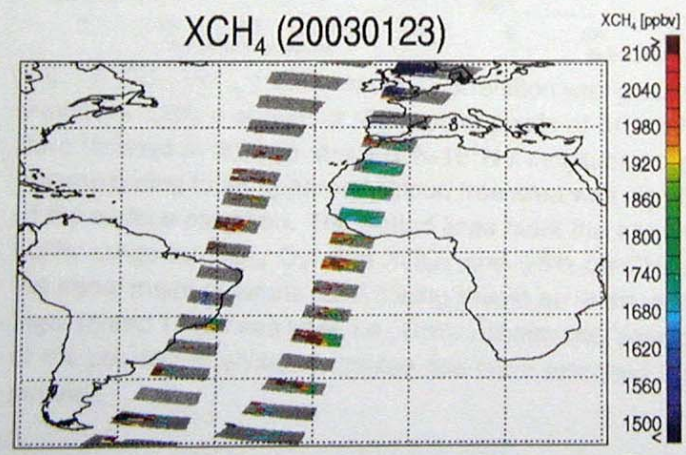

Fig. 14. XCH_4 derived from windows WIN_CH_8a (CH_4) and WIN_CH_4 (O_2). Here, the cloud mask has been applied (grey pixels).

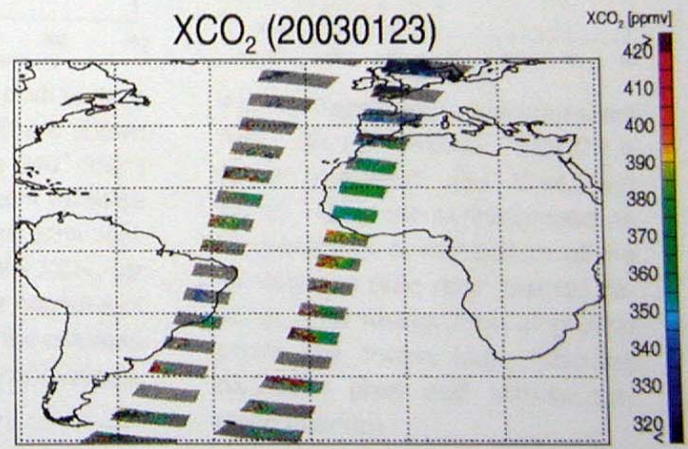

Fig. 15. XCO_2 derived from windows WIN_CH_6 (CO_2) and WIN_CH_4 (O_2). Here, the cloud mask has been applied (grey pixels).

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1.6um approach similar to OCO.

Wind retrievals and assimilation are a hot topic

GOES and MSG water winds and cloud winds

MODIS polar cloud winds

Accuracy of 1m/sec iis needed

Problems with interpretation because of the interaction between the horizontal and vertical motion of the moisture field and the temperature field are expected to be resolved using AIRS like spectral resolution from advanced GOES sounders.

Data assimilation into medium range forecast

Phil Watts (ECMWF) The assimilation of AIRS radiances shows a small but significant positive impact on the analysis and forecast quality in all areas

Wind assimilation is hot topic, but need 1 m/sec accuracy

Bob Atlas (DAO) predicted forecast impact form AIRS similar to that of LIDAR wind.

ECMWF is currently assimilating data from 27 satellites + AIRS

John Eyres (ECMWF) was surprise at finding positive impact from the assimilation of EOS Aqua AMSU-A data after assimilating AMSU-A from NOAA16 in the same orbit.

Conclusions

AIRS is not alone. Lot of remote sensing work going on areas where AIRS is contributing routine or research products

Hole hunting is still the accepted way of working in the IR

The hot topics are winds and co2

Increasing integration of data from multiple instrument

Lots of interest in AIRS, but the AIRS team need to lead the way of showing what can be done with hyperspectral resolution.

Show results at conferences, and start writing papers.

Focus issue on “First Results from EOS Aqua”

Focus issue on “Results from AIRS Validation”