



AIRS Level 2 Status



ITSC XIII

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Sung-Yung Lee(*), Evan Fishbein, Thomas Hearty,
Evan Manning, Edward Olsen
Jet Propulsion Laboratory
California Institute of Technology
* Sung-Yung.Lee@jpl.nasa.gov



Introduction to AIRS



- AIRS is a facility instrument on EOS Aqua
- AIRS is a grating spectrometer covering 650 to 2650 waver number, with gaps
 - Nominal Spectral Resolution of $1200 \nu/\delta\nu$
 - 2378 channels, or spectral samples
 - Spatial resolution of 1.1 degree, 15km footprint at nadir
 - 4 additional VIS/NIR channels at higher spatial resolution
- AIRS operates with microwave sounders AMSU-A and HSB
 - AMSU-A is a copy of NOAA's microwave sounder
 - HSB is functionally equivalent to NOAA's humidity sounder AMSU-B
 - The three instruments are synchronized to have 3 by 3 AIRS/HSB footprints within an AMSU footprint
- Level 1b products were made public in early 2003
- Major/Core level 2 products
 - Temperature Profile
 - Water Vapor Profile
 - Surface skin temperature and other surface parameters
 - Cloud fraction and cloud top pressure
- Goddard DAAC is processing level 2 with version V3.0.8
 - Provisionally validated only for ocean profiles between 40N and 40S.



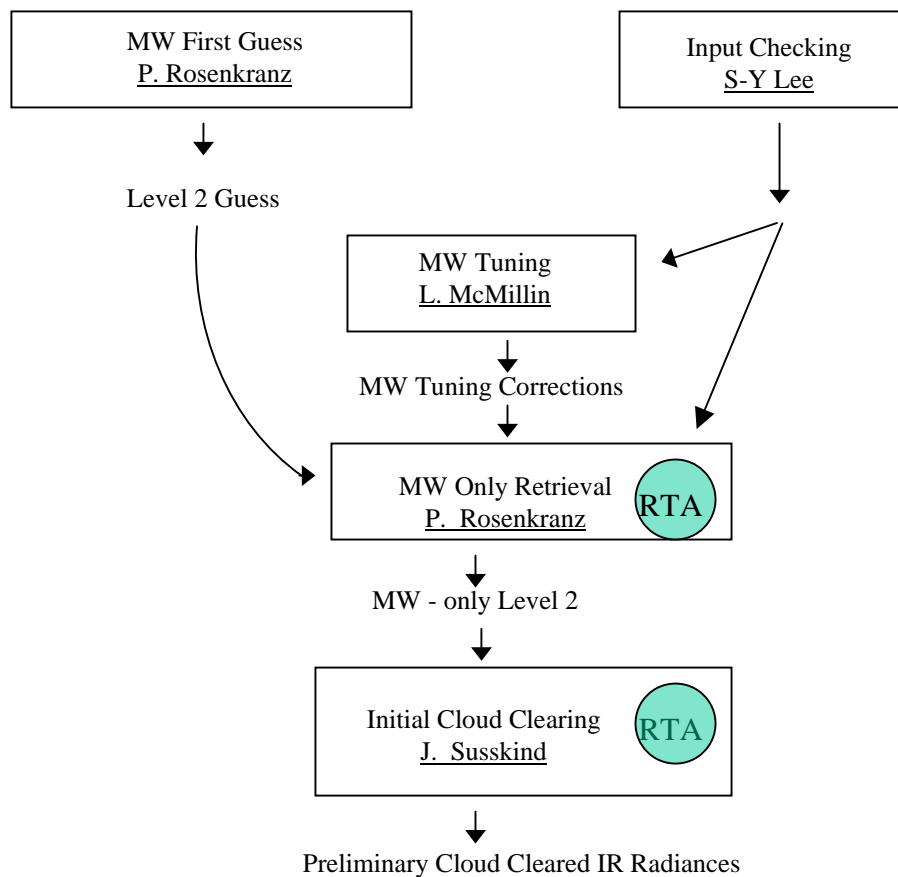
Main Contributors of Level 2 Algorithm



- Phill Rosenkranz of MIT
 - MW only retrieval algorithm and MW Forward Algorithm
- Catherine Gautier of UCSB
 - VIS/NIR algorithm
- Larrabee Strow of UMBC
 - AIRS Rapid Transmittance Algorithm
- Larry McMillin of NOAA/NESDIS
 - Brightness temperature tuning and local angle adjustment
- Mitch Goldberg of NOAA/NESDIS
 - Initial Regression Algorithm
- Joel Susskind of NASA/GSFC
 - Final retrieval algorithm and cloud clearing algorithm
- JPL is responsible for combining these algorithms into a unified team algorithm/software.

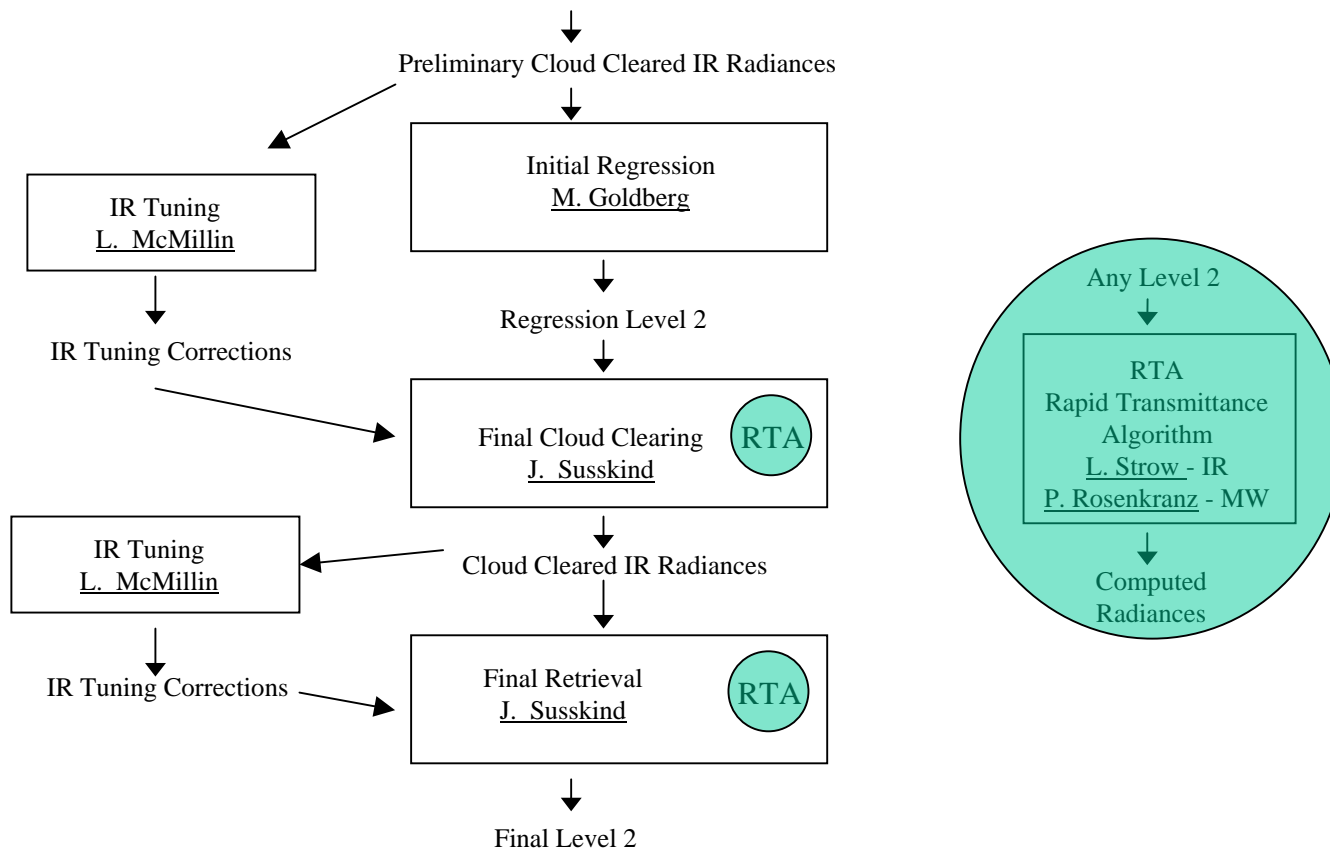


AIRS Level 2 Data Flow (1)



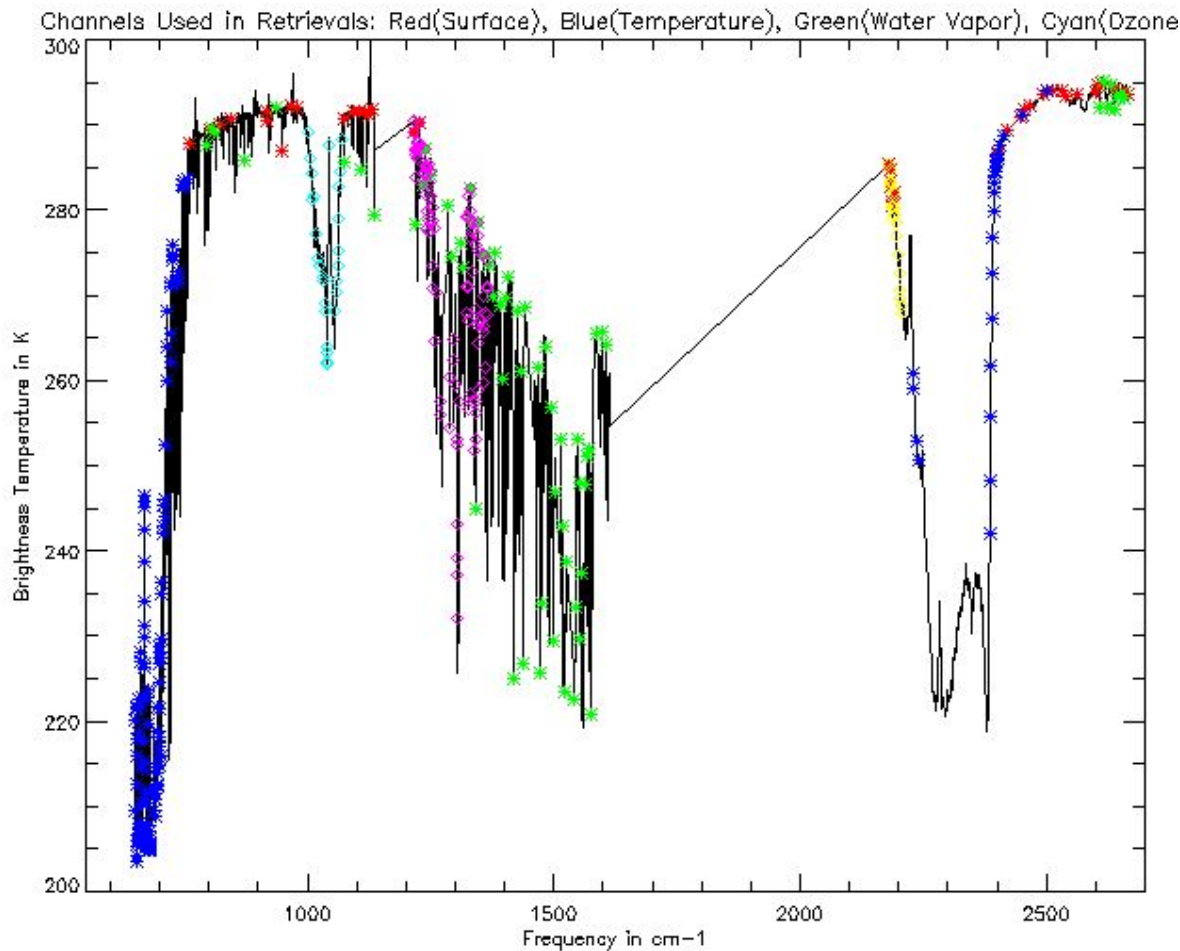


Data Flow (2)





All Level 2 Channels



- Spectrum is an observed profile for a night tropical case

- Temperature Sounding Channels: Blue

- Water Vapor Sound Channels: Green

- Window Channels: Red

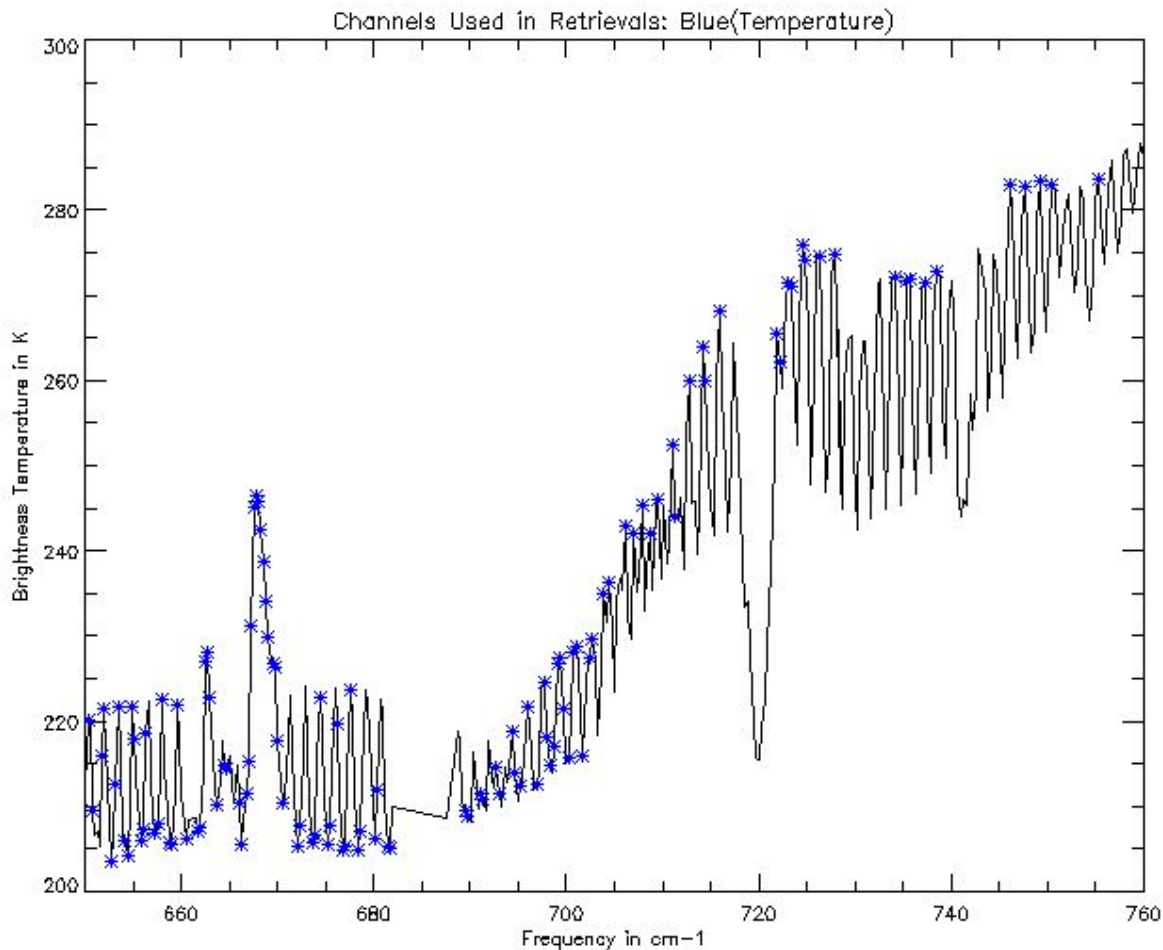
- Ozone Sounding Channels: Cyan

- Methane Channels: Magenta

- CO Channels: Yellow



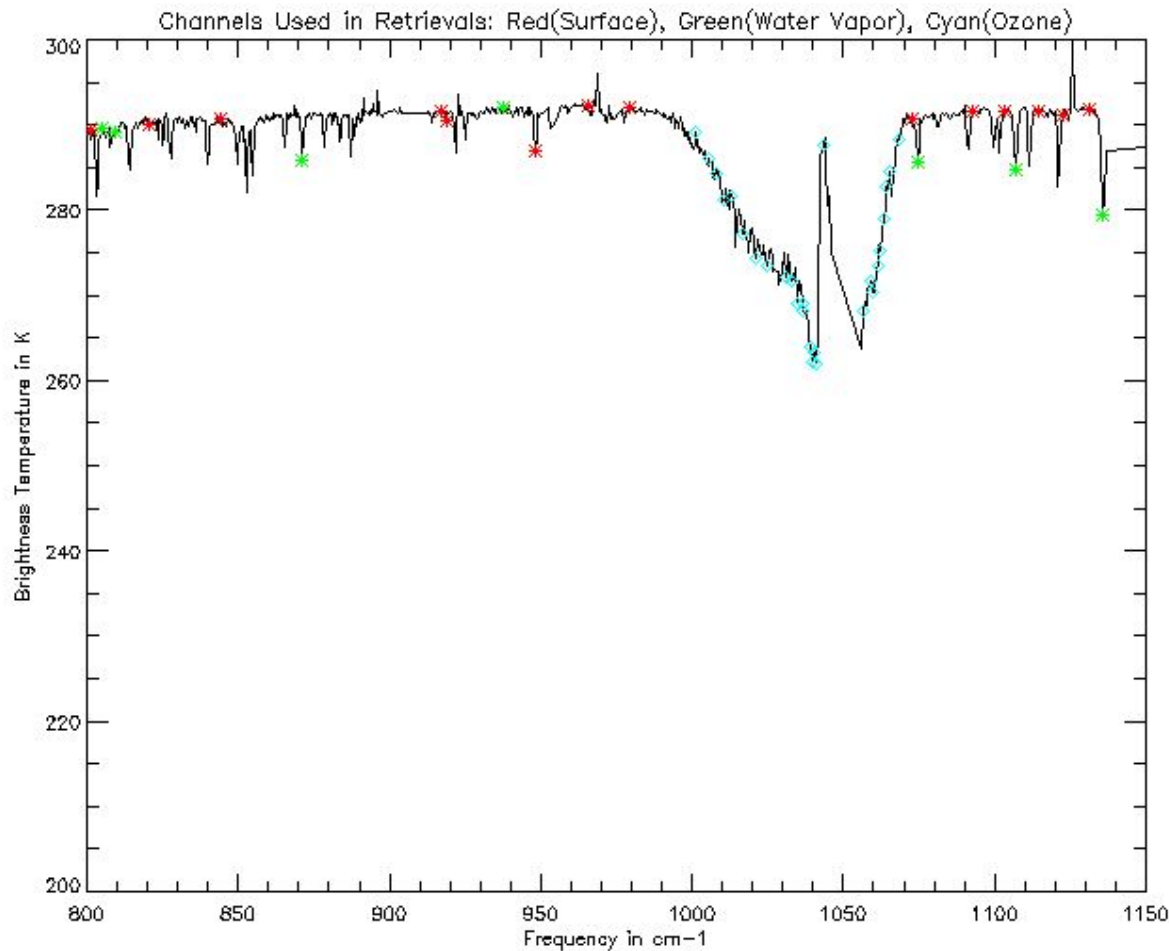
15 Micron CO2 Channels



- Temperature Sounding Channels: Blue
- Water Vapor Sound Channels: Green
- Window Channels: Red
- Ozone Sounding Channels: Cyan
- Methane Channels: Magenta
- CO Channels: Yellow



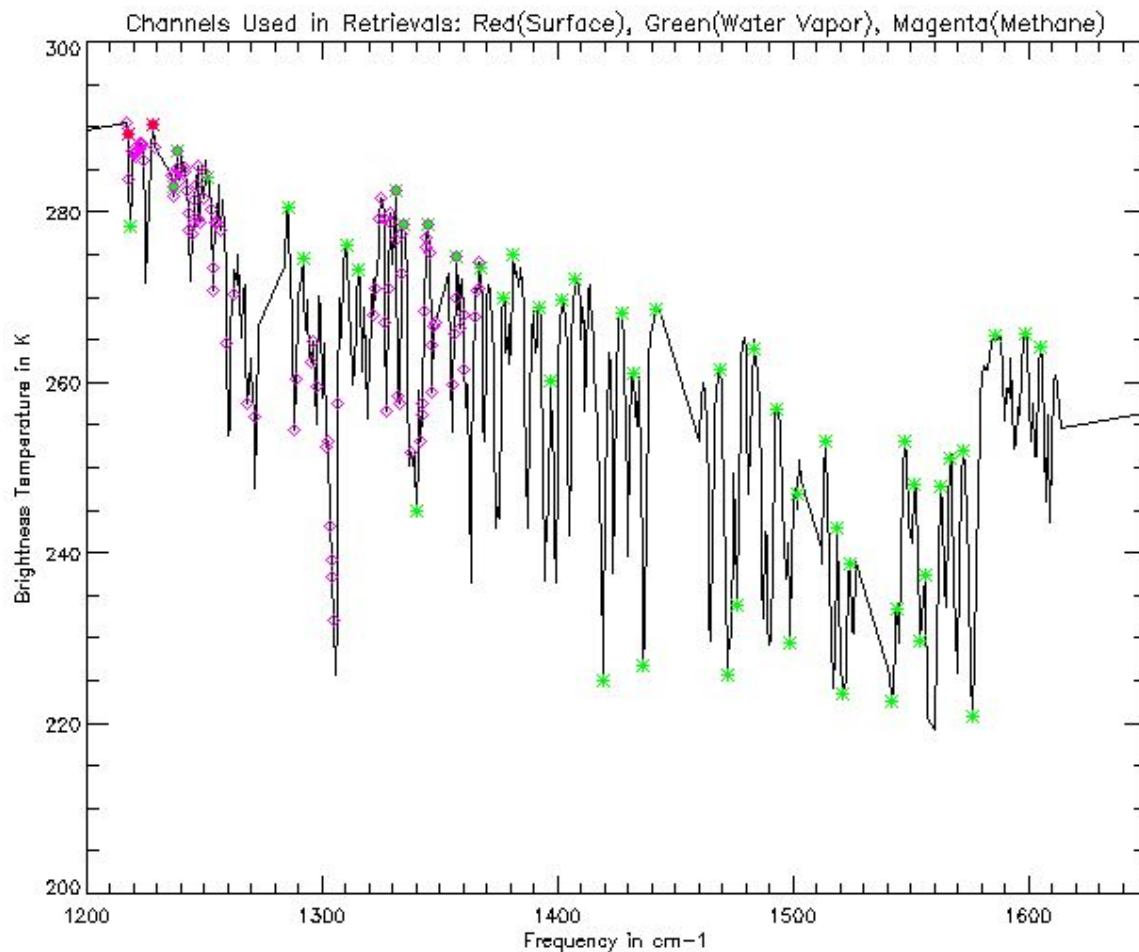
Longwave Window Channels



- Temperature Sounding Channels: Blue
- Water Vapor Sound Channels: Green
- Window Channels: Red
- Ozone Sounding Channels: Cyan
- Methane Channels: Magenta
- CO Channels: Yellow



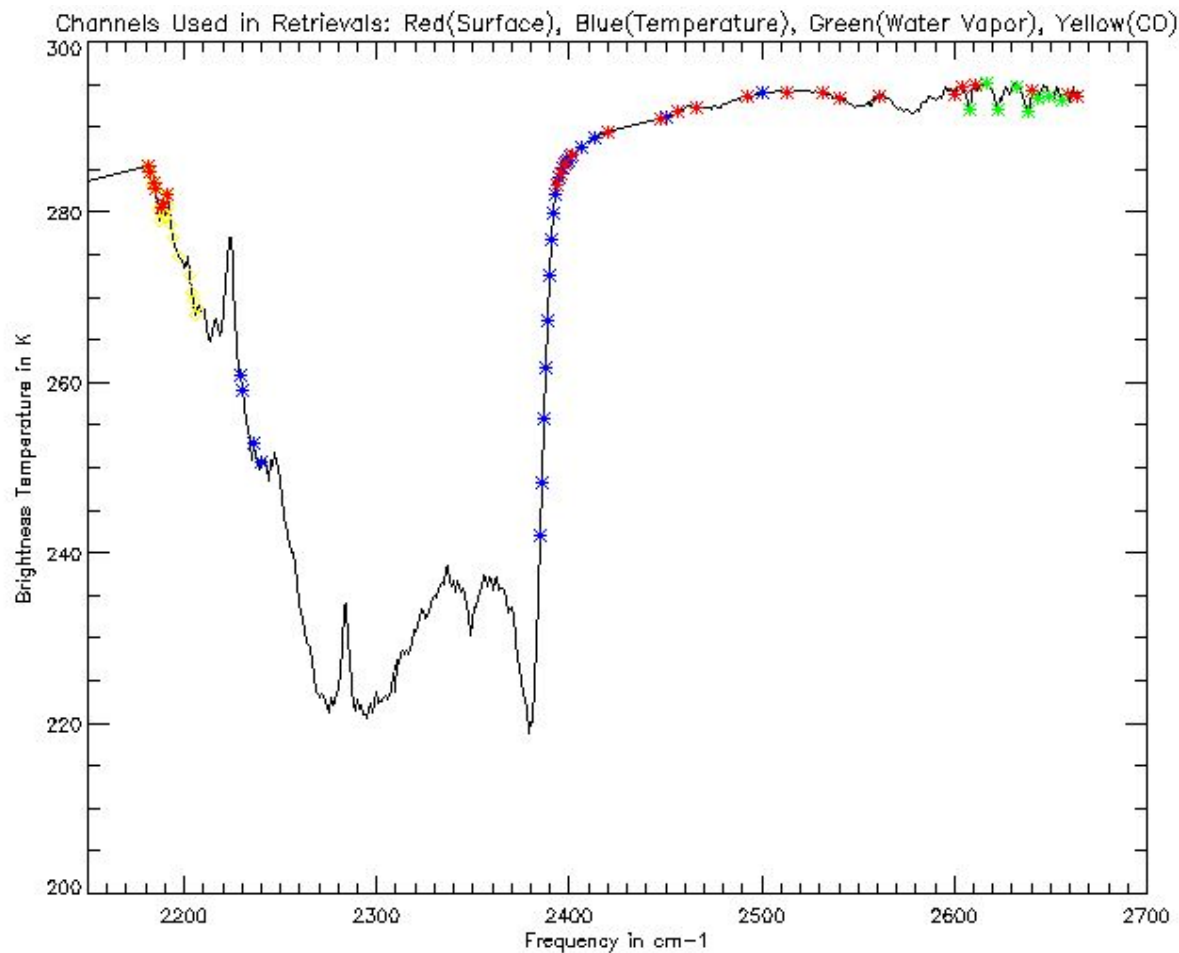
Water Band Channels



- Temperature Sounding Channels: Blue
- Water Vapor Sound Channels: Green
- Window Channels: Red
- Ozone Sounding Channels: Cyan
- Methane Channels: Magenta
- CO Channels: Yellow



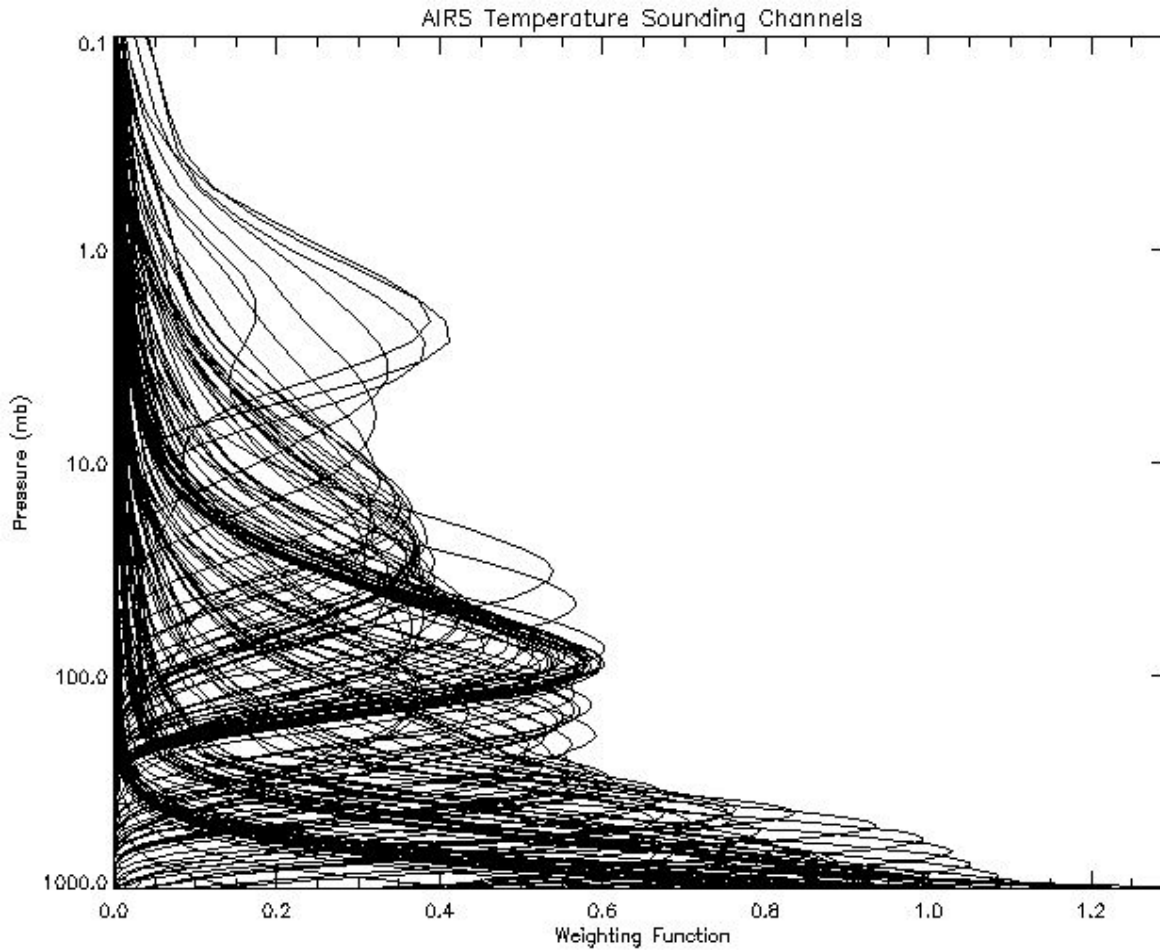
Shortwave Channels



- Temperature Sounding Channels: Blue
- Water Vapor Sound Channels: Green
- Window Channels: Red
- Ozone Sounding Channels: Cyan
- Methane Channels: Magenta
- CO Channels: Yellow



Temperature Weighting Functions

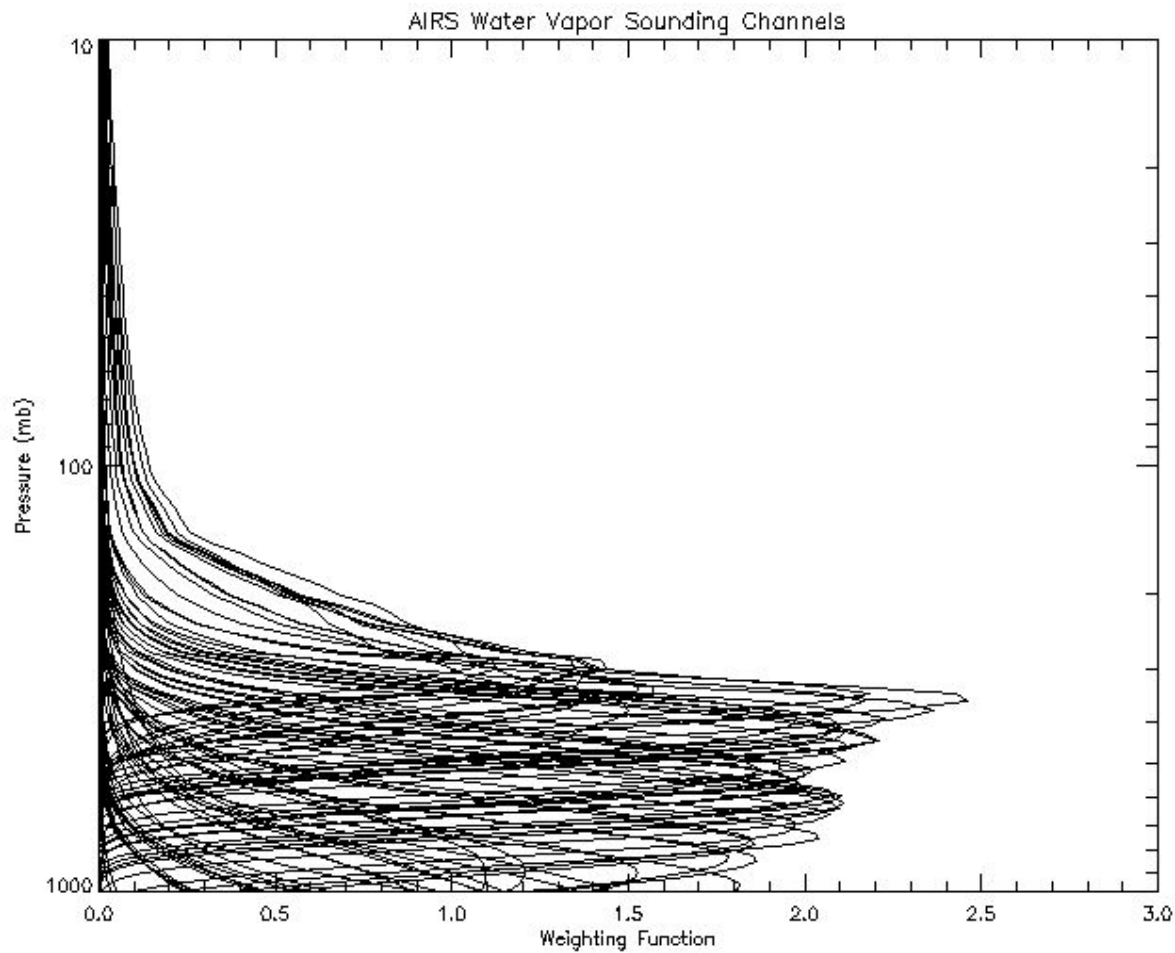


- AIRS radiances are sensitive to temperature at about 0.5 mb

- The weighting functions are computed for US Standard profile



Water Vapor Channels



- AIRS radiances are sensitive to water vapor near 100 mb



Level 2 Files



- One set of files for a granule, 6 minutes of data
 - 45 AMSU scan lines of data, 135 scan line of AIRS/HSB data
 - 240 granules per day
 - All files are in swath format of HDF-EOS
- Level 2 standard file
 - Standard or core products
 - Temperature, Water vapor, and Ozone Profiles at 28 mandatory pressure levels
 - Surface and cloud properties
- Level 2 support file
 - Research products and intermediate products
 - Profiles at 100 pressure levels
 - Dependent on the standard file
 - Not all parameters in standard file are duplicated
- Cloud cleared radiance file
 - Radiances that would have been observed if there was no cloud
 - Available about 60% of AMSU footprints
 - May be available up to 80% cloud fraction.
- Browse Products
 - Raster image for daily maps of various AIRS products
 - Ascending and descending maps



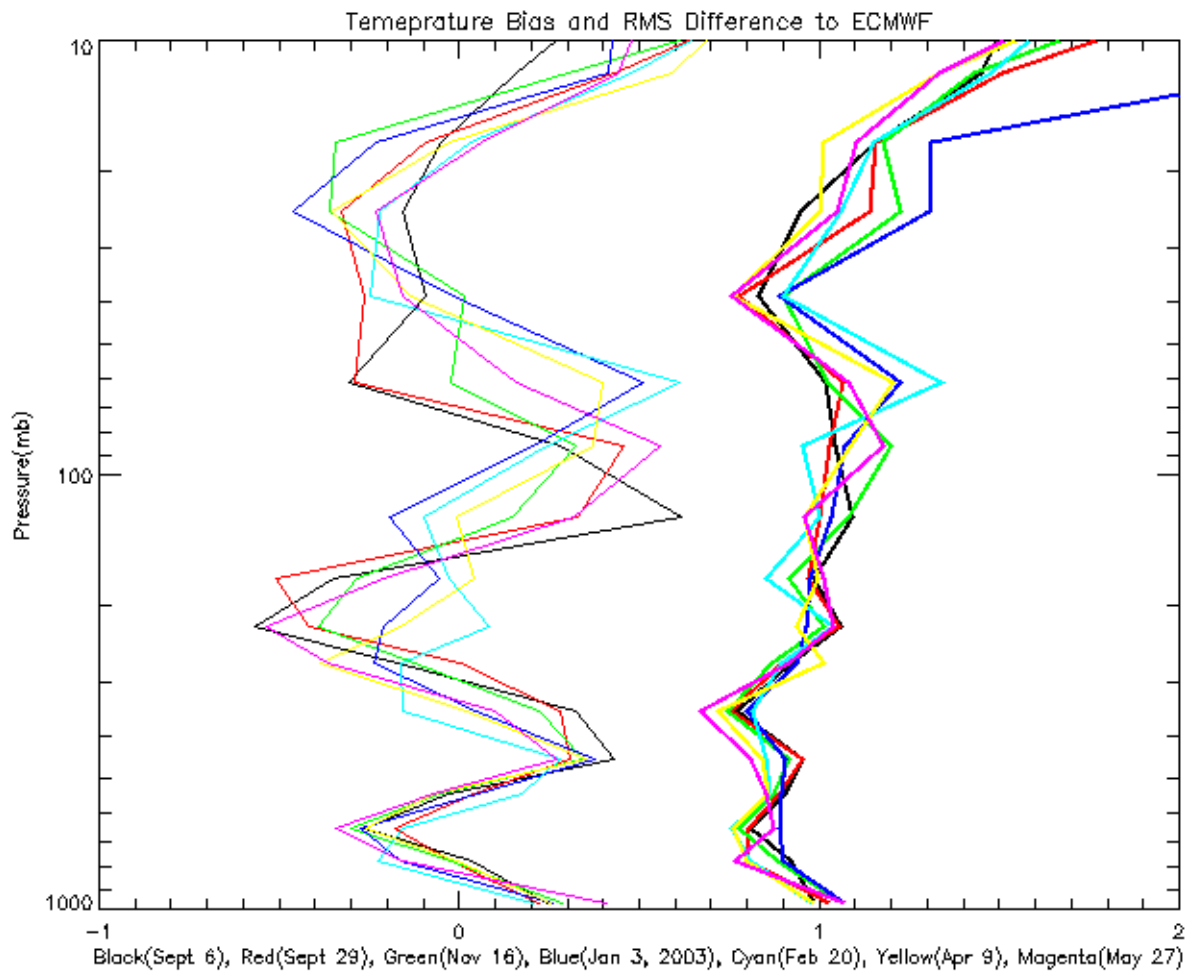
Public Release of AIRS Level 2 Data



- Started in August 2003
 - Old data since September 2002 will be processed
- Level 2 Standard files
- Level 2 Support files
- Level 2 Cloud Cleared Radiance files
- Daily Browse products
 - Ascending/Descending maps at one degree by one degree resolution
 - Cloud Fraction, Surface Skin temperature, Total Precipitable Water Vapor, Total Ozone Burden, Total Cloud Liquid Water, Rain Rate, Emissivities at 800, 1000, 1200, and 2500 cm^{-1}
- Documentation
 - http://daac.gsfc.nasa.gov/atmodyn/airs/airs_documentation.html
- Points of Contact
 - Atmospheric Dynamics Data Support Team at atmdyn-dst@daac.gsfc.nasa.gov
 - Dr. Edward Olsen at Edward.T.Olsen@jpl.nasa.gov
- Software for direct downlink data will be made available soon



Temperature Statistics vs ECMWF Analysis



- 7 Focus days (normally 48 days apart)

- Stable statistics over 9 months period



Sample Monthly Mean Products



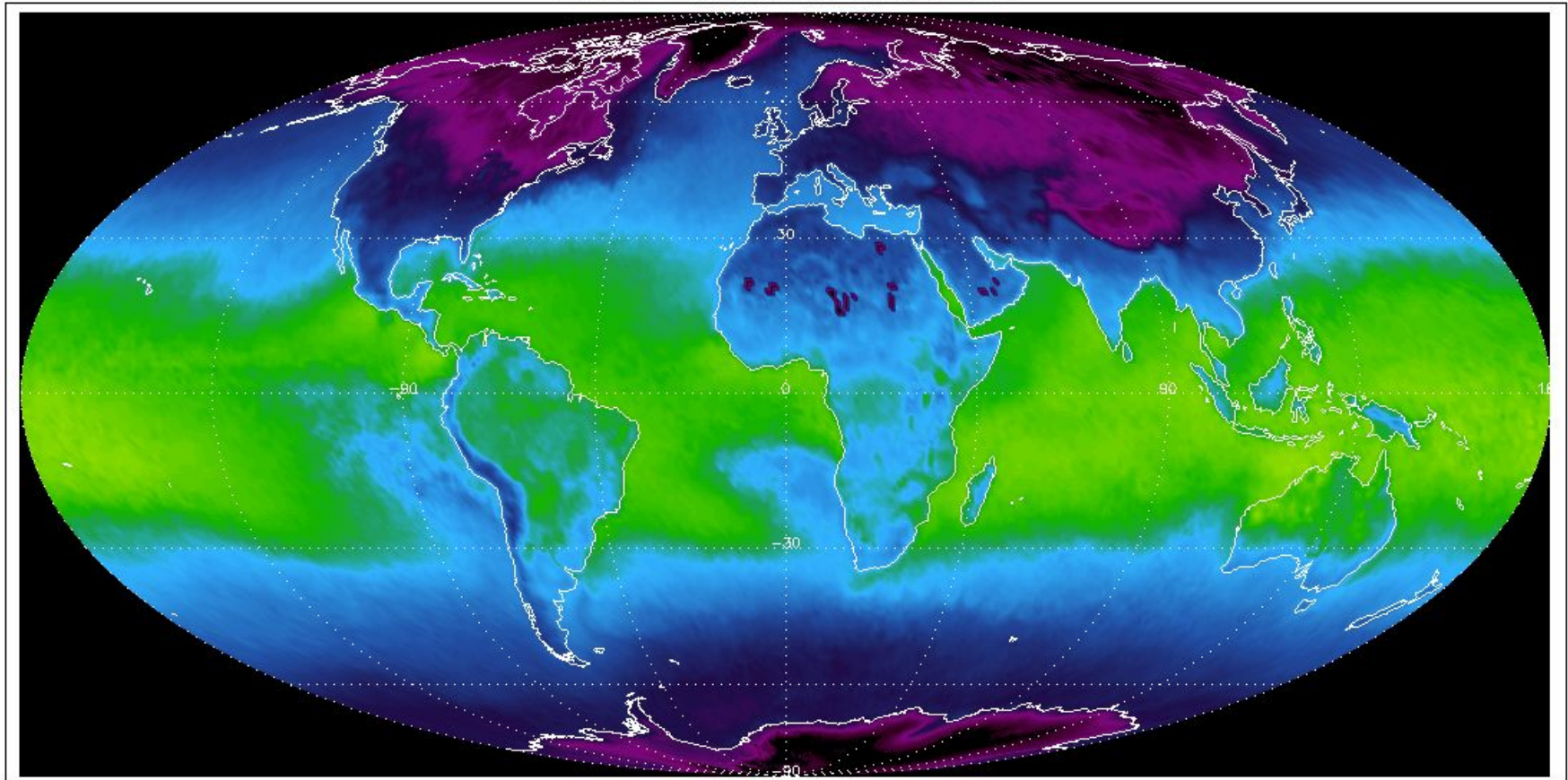
- Simple gridded data based on January 2003 data
 - Separate maps for ascending (day) and descending (night) parts of orbit
 - One degree by one degree resolution
- For these maps, only the second half of RetQAFlag was checked
 - The first byte (bit numbers 8 through 15) was ignored



Monthly Mean Surface Skin Temperature Descending Orbits - January 2003



Mean Total SST for Descending orbits of Q1/2003



October, 2003

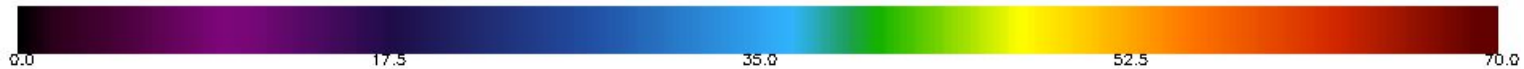
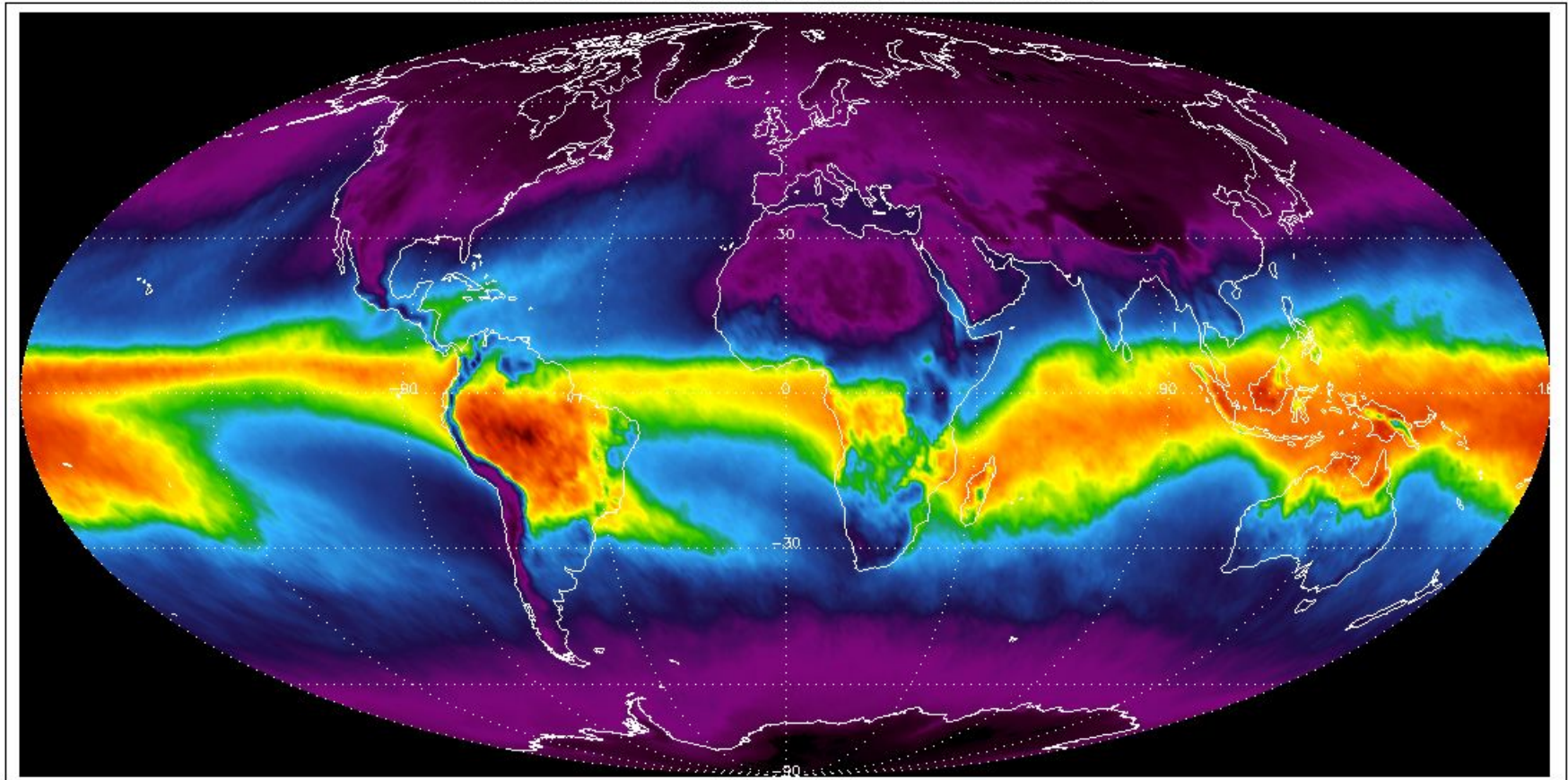




Monthly Mean Total Precipitable Water Vapor Descending Orbits - January 2003



Mean Total Precipitable Water Vapor for Descending orbits of 01/2003



October, 2003

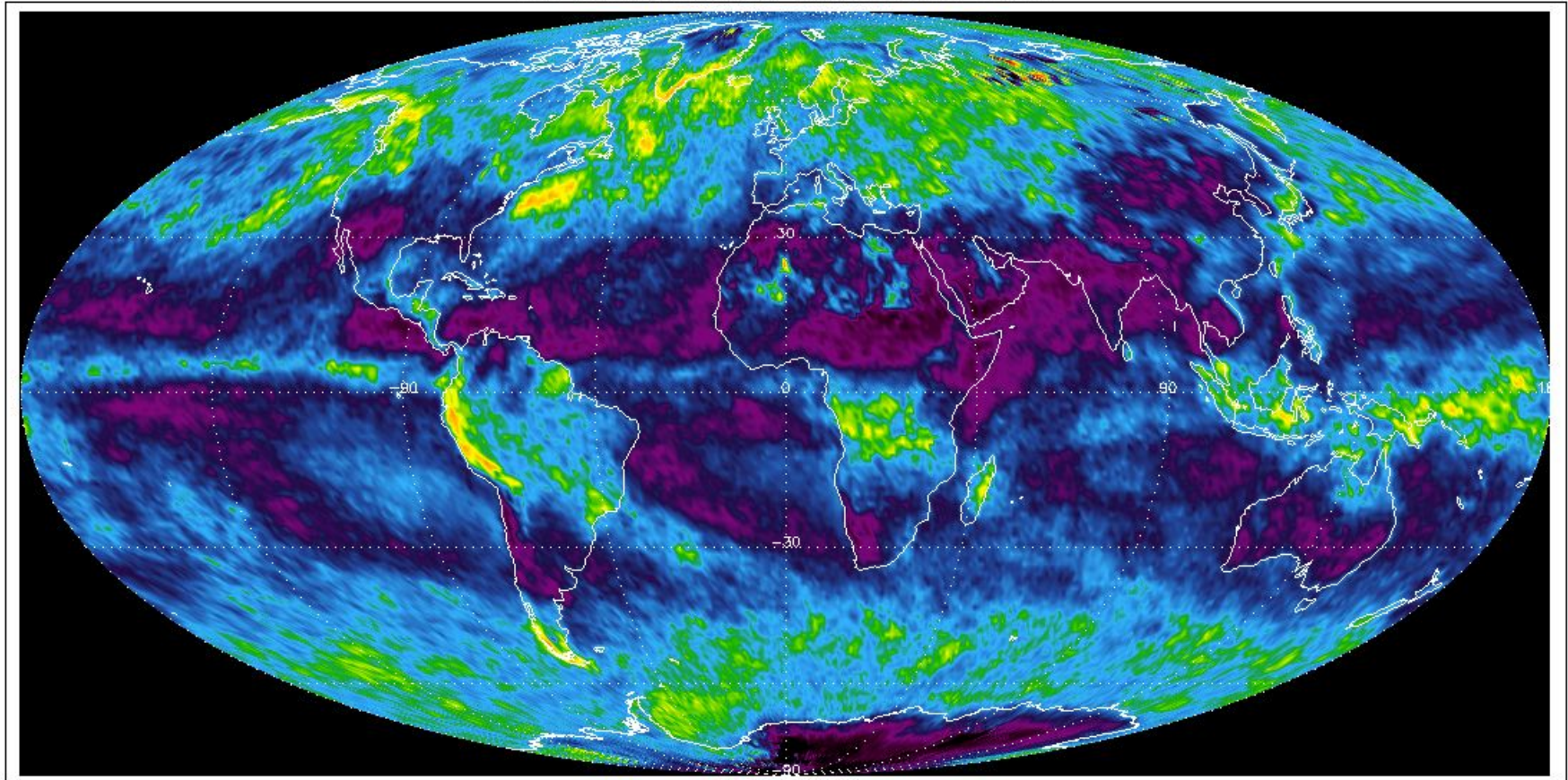




Monthly Mean Cloud Fraction Ascending Orbits - January 2003



Mean Total Cloud Fraction for Ascending orbits of 01/2003



October, 2003



International TOVS Study Conference, 13th, TOVS-13, Sainte Adele, Quebec, Canada, 29
October-4 November 2003. Madison, WI, University of Wisconsin-Madison, Space Science and
Engineering Center, Cooperative Institute for Meteorological Satellite Studies, 2003.