AIRS

ATMOSPHERIC INFRARED SOUNDER *fact sheet*

The Next Generation of Atmospheric Data Is Here

The Atmospheric Infrared Sounder (AIRS) moves climate research and weather prediction into the 21st century. AIRS is one of six instruments on board Aqua, part of NASA's Earth Observing System. AIRS, along with its partner microwave instrument, Advanced Microwave Sounding Unit (AMSU-A), represents the most advanced atmospheric sounding system ever deployed in space. Together these instruments observe the global water and energy cycles, climate variation and trends, and the response of the climate system to increased greenhouse gases.

AIRS uses cutting-edge infrared technology to create 3-dimensional maps of air and surface temperature, water vapor, and cloud properties. With 2378 spectral channels, AIRS has a spectral resolution more than 100 times greater than previous IR sounders and provides more accurate information on the vertical profiles of atmospheric temperature and moisture. AIRS can also measure trace greenhouse gases such as ozone, carbon monoxide, and methane. AIRS and AMSU-A share the Aqua satellite with the Moderate Resolution Imaging Spectroradiometer (MODIS), Clouds and the Earth's Radiant Energy System (CERES), and the Advanced Microwave Scanning Radiometer–EOS (AMSR-E). Aqua is part of NASA's "A-train," a series of high-inclination, Sun-synchronous satellites in low Earth orbit designed to make long-term global observations of the land surface, biosphere, solid Earth, atmosphere, and oceans.

Announcing AIRS Version 4.0

Here's what's new:
- Temperature is validated to 1K in 1 km vertical layers over ocean
- Water vapor is validated to 15% in 2 km vertical layers over ocean
- Improved retrievals over land
- Improved cloud properties
- Improved and expanded AIRS data quality indicators
- Radiance (Level 1B) files are now half the size
- Gridded products (Level 3) are now available

New on the Goddard DAAC (AIRS data distribution center):
- Radiance data are now subsettable by date, geolocation, and channel
- Retrieved products (Level 2) are now subsettable by geophysical parameters
- Data from the Humidity Sounder for Brazil (HSB), a microwave sensor on board Aqua, ended in February 2003. Goddard DAAC has two sets of AIRS data from September 2002–February 2003. One set incorporates HSB data; the other set does not.

Standard data products

All data are distributed in HDF EOS Swath format.

Radiance Products (Level 1B)
- AIRS IR Radiance
- AIRS VIS/NIR Radiance
- AMSU Radiance

Core Data Products (Level 2)
- Cloud-Cleared IR Radiance
- Sea Surface Temperature and Emissivity
- Land Surface Temperature and Emissivity
- Temperature Profile
- Humidity Profile
- Total Precipitable Water
- Fractional Cloud Cover
- Cloud Top Height and Temperature
- Total Ozone Burden
- Profile Pressure Grid comprising 28 levels from 1100 to 0.1 hpa
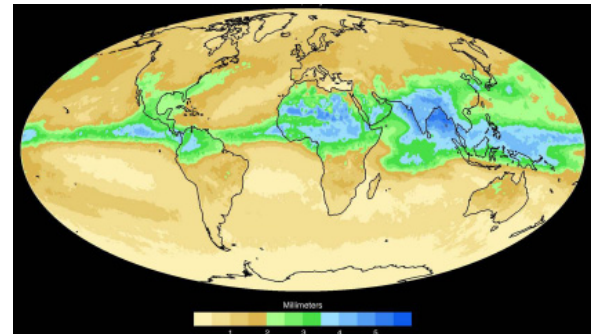
Gridded products (Level 3)

These products are derived from Level 2 Products separately for ascending and descending portions of the orbits and binned into 1° x 1° by averaging and are available in 3 temporal ranges — daily, 8-day (one half of the Aqua satellite repeat cycle), and monthly.

- Temperature profiles (24 levels, to 1 mb)
- Moisture profiles (12 layers, to 100 mb)
- Outgoing long-wave radiation (observed, cloud-cleared)
- Surface temperatures (air, skin) and emissivity

Research products

Ozone vertical distribution, carbon monoxide total column, methane distribution, carbon dioxide

Mean clear air precipitable water, from 500 millibars to the top of the atmosphere (AIRS data, July 2003).

AIRS instrument suite technical specifications

Launch date	May 4, 2002
Orbit	705 km polar, Sun synchronous, 98.2 ±0.1 degree inclination, ascending node: 1:30 pm ±15 minutes, period: 98.8 minutes
Swath width	1650 km (±49.5 degrees)
Ground coverage	>95% global daily
Temporal coverage	Global, twice daily swath (day and night)
Design life	5 years (instruments began operations in June 2002)

AIRS Radiances (Level 1B)

Spatial resolution	14 km at nadir; 41 km × 21.4 km at the scan extremes
Spatial sampling	90 footprints per scan (2.67 seconds)
Spectral range	2378 channels from 3.74–15.4 μm (2670–650 cm^{-1})
Spectral response	
Spectral resolution	$\lambda/\Delta\lambda \approx 1200$ nominal
Spectral sampling	$\lambda/\Delta\lambda \approx 2400$
Sensitivity (NeDT)*	0.20 K from 3.7–13.5 μm 0.35 K from 13.6–15.4 μm
Radiometric calibration	< 0.2% absolute error
Volume	≈ 62 MB/granule (6 minutes), 15 GB/day (before V4.0, volume = 122 MB/granule)

Vis/NIR Radiances (Level 1B)

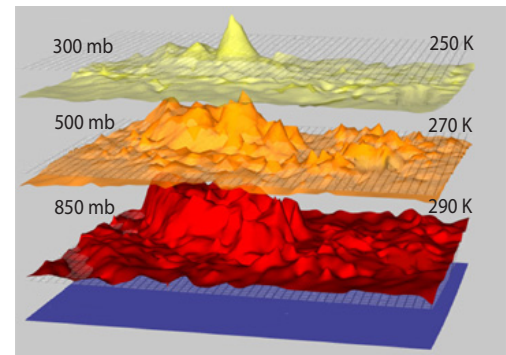|	
Spatial resolution	2.3 km each pixel
Spatial sampling	8 × 9 pixels per AIRS 14 km footprint
Spectral range	Four channels from 0.4–1.0 μm
	Channel 1: 0.41–0.44 μm
	Channel 2: 0.58–0.68 μm
	Channel 3: 0.71–0.92 μm
	Channel 4: 0.49–0.94 μm
SNR** at albedo of 0.4	100
Radiometric accuracy	10%
Volume	16.6 MB/granule (6 minutes), 4.0 GB/day

AMSU-A

Spatial resolution	40.5 km at nadir
Spatial sampling	30 footprints per scan (8 seconds)
Spectral range	15 spectral channels between 23.8–89 GHz
Bandwidth	Channels 1–9: 160–400 MHz
	Channels 10–14: 12–150 MHz
	Channel 15: 2000 MHz
Sensitivity (NeDT)*	0.2–0.8 K
Volume	0.5 MB/granule (6 minutes), 123 MB/day

HSB

Spatial resolution	14 km at nadir
Spectral resolution	0.5–2.0 GHz
Spectral range	150–183.3 GHz
Sensitivity (NeDT)*	0.28–0.58 K

* NeDT = noise equivalent delta temperature per resolution element at 250 K
** SNR = signal-to-noise ratio

Warm core of supertyphoon Pongsona revealed in isotherms made from AIRS data.

How to get AIRS data

The Distributed Active Archive Center at Goddard Space Flight Center (GSFC/DAAC) serves as the central facility for the processing, archiving, and distribution of EOS Aqua data. There are three ways to access AIRS data from the DAAC:

Data pool: online access to most recent AIRS data from GSFC/DAAC —

daac.gsfc.nasa.gov/data/datapool/AIRS_DP/

Web hierarchical ordering mechanism (WHOM): data search and order from GSFC/ DAAC —

daac.gsfc.nasa.gov/data/dataset/AIRS/

EOS Data Gateway: data search and order tool —

redhook.gsfc.nasa.gov/~imswww/pub/imswelcome/

Resources and help

AIRS data support home page at GSFC/DAAC (a user-friendly website with information on AIRS data products) —

daac.gsfc.nasa.gov/atmodyn/airs/

AIRS public website (contains information, images, and contact information) —

airs.jpl.nasa.gov

ASK AIRS (online form for questions about AIRS data and products) —

airs-inquiry.jpl.nasa.gov/feedback/feedback_form.cfm

The Jet Propulsion Laboratory, California Institute of Technology, manages the AIRS instrument suite for the National Aeronautics and Space Administration.

National Aeronautics and Space Administration

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