

Infrared Remote Sensing Through Clouds With the AIRS-AMSU-HSB Sounding System on Aqua

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The main objective of the AIRS-AMSU-HSB sounding system on Aqua is to demonstrate accurate remote sounding of the atmospheric state in the presence of clouds. The AIRS instrument represents a breakthrough in infrared space instrumentation. The AIRS has 2378 infrared channels in the range of 3.7 - 15.4 microns with a nominal spectral resolution of 1200. A year after launch, the AIRS-AMSU-HSB system has demonstrated its ability of eliminating the effects of clouds on the AIRS infrared radiances (spectrum) in the presence of up to 80% cloud opacity in the AIRS fields of view. From the resulting cloud-cleared infrared radiances we have retrieved temperature profiles with radiosonde accuracy. The AIRS-AMSU-HSB instrument suite on Aqua is designed to meet both the NOAA operational weather prediction requirements as well as NASA's climate research needs.

The three instrument suite will gather more accurate meteorological information about the Earth's atmosphere and its circulation than ever done before and will reduce the error of the initial state for weather forecasting. For the first time, a satellite remote sensing instrument will achieve, worldwide, the same accuracy in temperature as currently possible only with direct measurements by balloon-borne sensors. For moisture, however, the accuracy of AIRS-AMSU-HSB will exceed that measured by balloon-borne sensors

The performance of AIRS since launch has been exceptional indicating that the AIRS-AMSU-HSB instrument suite will meet or exceed its objective to deliver:

- 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.

In addition to several research products such as the total CO₂ burden of the atmosphere, CO and CH₄ profiles.