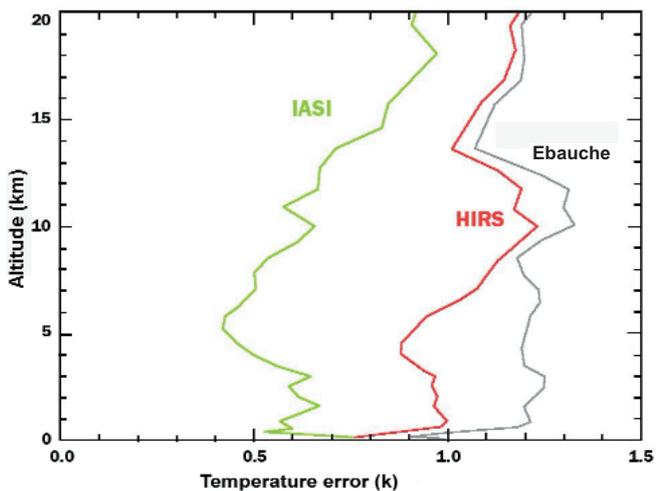
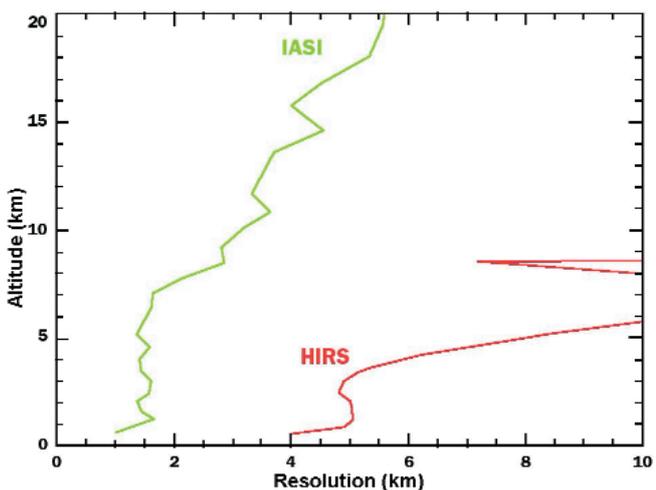


Satellite atmospheric sounding instruments (2)



Sounding temperature errors for IASI and HIRS



Vertical temperature resolution
Extractions for IASI and HIRS

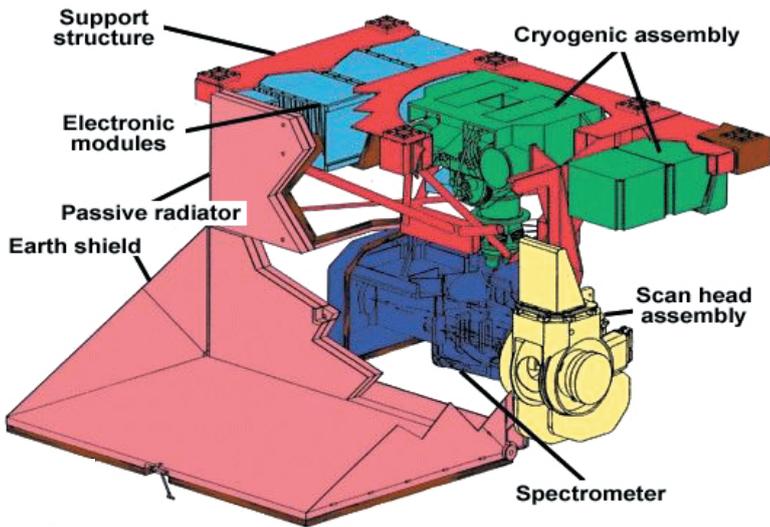
The new high resolution sounders that will be equipped on the future polar orbiting satellites will halve the errors with respect to the instruments in flight on the current NOAA satellites. This constitutes a major advance in the science of remote sensing applied to meteorology, climate research and other disciplines.

The high resolution sounders will take measurements of the atmosphere and surface of the Earth, enabling scientists to improve their meteorological forecasts, obtain a better understanding of the role of the clouds and water vapour in the variations in world temperature, detect the impact of greenhouse gases and study the evolution of the climate, water cycle and energy at a global level.

IASI

IASI, the Infrared Atmospheric Sounding Interferometer is a new instrument that will be on-board the METOP satellites. It will gather the atmospheric temperature and humidity profiles and provide additional information in a whole series of geophysical parameters including atmospheric ozone and other trace gases. This instrument is the result of collaboration between the CNES and EUMETSAT. The resolution is 12 km at the nadir. The scanning time (8 seconds) and the horizontal sampling distance are identical to those of the AMSU-A instrument so as to facilitate the combined use of both instruments. In addition, to enable comparisons to be made with the AVHRR, the instrument will have an integrated imager that will gather data on the IASI sounding pixels with a one kilometre spatial resolution.

IASI is a Michelson interferometer operating within the spectral range of 3.6 to 15.5 μm (2760 cm^{-1} to 645 cm^{-1}). Scientific studies have shown that with spectral sampling of 0.25 cm^{-1} (corresponding to over 8000 channels) the instrument will obtain up to 19 separate items of information concerning the vertical structure of the temperatures and water vapour in the atmosphere. This will provide greatly improved vertical resolutions in comparison with those of current operational instruments and obtain the accuracy of one degree for the temperatures of one-kilometre layers and 10% for the humidity of two-kilometre layers.



AIRS

AIRS, together with the Advanced Microwave Sounder Unit (AMSU), are the successors of the High Resolution Infrared Radiation Sounder (HIRS) and the Microwave Sounder Unit (MSU) onboard the different polar orbiting satellites of the NOAA for almost 20 years. With AIRS, the accuracy of the measurements will be 1°C for the temperatures of 1 km layers and 20% for the humidity of 2 km layers in the troposphere (lower part of the atmosphere). Weather forecasts will be greatly improved by this. This instrument is onboard the NASA satellite Aqua, precursor of the operational series NPOESS (National Polar-orbiting Operational Environmental Satellite System).

AIRS is a high resolution spectrometer with almost 2400 bands in the infrared and the visible: 3.7 - 15 µm and 0.4 - 1.0 µm. These ranges were specifically chosen to enable the measurement of temperature and humidity.

AIRS enables temperature and humidity profiles to be retrieved by observing the carbon dioxide "signature" in the 4.2 µm and 15 µm wavelengths and water vapour close to 6.3 µm. Atmospheric gases such as carbon dioxide, water vapour, ozone and methane strongly absorb infrared energy at certain wavelengths. This absorption increases both in intensity and in bandwidth with increasing concentrations of atmospheric gas and hence with increasing depth in the atmosphere. Through the high-resolution observation of several wavelengths near the centre of the absorption bands (e.g. 4.2, 15, or 6.3 µm), one can "see" at various levels in the atmosphere. The intensity of the signal in a specific band also depends on the temperature.

