

EARTH OBSERVATION SYMPOSIUM (B1)
GEOSS and Carbon Monitoring from Space (6)

Author: Mr. Thomas Pagano

National Aeronautics and Space Administration (NASA), Jet Propulsion Laboratory, United States,
tpagano@jpl.nasa.gov

Dr. Moustafa Chahine

Caltech/JPL, United States, moustafa.t.chahine@jpl.nasa.gov

Dr. Edward Olsen

Jet Propulsion Laboratory - California Institute of Technology, United States, edward.t.olsen@jpl.nasa.gov

SEVEN YEARS OF OBSERVATIONS OF MID-TROPOSPHERIC CO₂ FROM THE ATMOSPHERIC
INFRARED SOUNDER

Abstract

The Atmospheric Infrared Sounder (AIRS) on the EOS Aqua Spacecraft was launched on May 4, 2002. AIRS acquires hyperspectral infrared radiances in the 3.7-15.4 μm spectral region with spectral resolution of better than 1200. The AIRS was designed to measure temperature and water vapor profiles and cloud properties for improvement in weather forecast and improved parameterization of climate processes. Currently the AIRS Level 1B Radiance Products are assimilated by NWP centers and have shown considerable forecast improvement. Scientists have also demonstrated accurate retrievals of minor gases from AIRS including Carbon Monoxide, Methane, Ozone, and Carbon Dioxide. Vertical sensitivities for the composition products varies, with Ozone and Methane most sensitive to the upper troposphere and stratosphere, while Carbon Monoxide is sensitive to the lower troposphere. The excellent sensitivity and stability of the AIRS instrument has allowed, the AIRS team to successfully retrieve Carbon Dioxide (CO₂) concentrations in the mid-troposphere (8-10 km) with a horizontal resolution of 100 km and accuracy of 1-2 ppm. The AIRS retrieves over 15,000 measurements per day and can achieve full global coverage in 30 days. The AIRS CO₂ accuracy has been validated against a variety of aircraft measurements in the mid-troposphere and upward looking interferometers. Findings from the AIRS data include higher than expected variability in the mid-troposphere, the presence of a belt of CO₂ in the southern hemisphere, and numerous observations of atmospheric circulation including the effects of El Nino/La Nina on the CO₂ concentrations in the mid-troposphere. AIRS Mid Tropospheric CO₂ can also be used in conjunction with total column observations to retrieve CO₂ in the boundary layer. The full mid-tropospheric AIRS CO₂ data set is now available at the NASA GES/DISC along with timeseries animations of the global distribution for the seven years since AIRS has been operational.