7.5 Years of Atmospheric Infrared Sounder (AIRS) Mid-Tropospheric CO_2 - Validations and Applications

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The AIRS enables us to monitor for the first time the global distribution and transport of middle-tropospheric CO_2 day and night, over oceans and land. Mid tropospheric CO_2 retrieved by the AIRS shows a substantial spatiotemporal variability that is supported by *in situ* aircraft measurements [Chahine et al., 2008]. The distribution of middle tropospheric CO_2 is strongly influenced by surface sources and large scale circulations such as the mid-latitude jet streams and by synoptic weather systems, most notably in the summer hemisphere. In addition, the effects of stratosphere troposphere exchange are observed during a final stratospheric warming event.

The retrieved AIRS mid-tropospheric CO_2 are compared to *in situ* measurements by commercial and research aircraft and to retrievals by land based upward looking Fourier Transform Interferometers. Validation of AIRS CO_2 data with respect to *in situ* observations has demonstrated the retrieval accuracy is better than 2 ppm. The average annual trend for the increase of mid-tropospheric CO_2 between 2003 and 2008 is ~2 ppm/year. We will focus on the significance of the retrieved CO_2 results by establishing their quantitative bounds on the random and systematic errors. This is of paramount importance for their use in modeling efforts to understand the sources and sinks and the lifting of CO_2 from surface layers into the free troposphere.

The AIRS CO_2 products may be downloaded from the Goddard Earth Science Data and Information Services Center. Access links to the products are provided on the web page: http://airs.jpl.nasa.gov/AIRS_CO2_Data

Data Format: Hierarchical Data Format (HDF)-Earth Observing System (EOS) Swath (L2) and HDF-EOS Grid (L3), Global Coverage: -180° ≤ longitude ≤ +180°, -60° ≤ latitude ≤ +90°, User Document Included.

AIRS Level 2 CO_2 Products:

- Nominal nadir resolution: 100km x 100km
- Data Content: Date, upper-tropospheric, lat, long, land fraction, solar zenith angle, CO_2 (ppm), CO_2 error measure by spatial coherence QA (ppm) and CO_2 averaging kernel (100 levels)

AIRS Level 3 CO_2 Products:

- Spatial Grid: 2° latitude by 2.5° longitude
- Time Granularity: daily, 8-day and calendar monthly