Global Observations of Carbon Monoxide, Methane, and Carbon Dioxide in the Free Troposphere Derived from the Atmospheric Infrared Sounder (AIRS)

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The Atmospheric Infrared Sounder (AIRS), launched in May of 2002, has the capability to measure trace gases, including ozone, carbon monoxide, methane, carbon dioxide, nitric acid, nitrous oxide, and sulfur dioxide. These products can also be derived from future sounders such as the Infrared Atmospheric Sounding Interferometer (IASI), the Cross-track Infrared Sounder (CrIS), and Hyperspectral Environmental Suite (HES), to be launched in 2006, 2009, and 2012, respectively. Together these instruments can provide measurements of the mid-tropospheric concentration of these gases for at least two decades. Monthly maps of carbon trace gas concentrations from multi-year AIRS reprocessing experiments have been produced along with the associated vertical retrieval weighting functions. Results from these experiments will be discussed with an emphasis on the utility and limitations of these datasets in modeling. Comparisons of the AIRS ozone products with in-situ measurements taken during the Stratospheric-Tropospheric Analysis of Regional Transport (START) experiment will also be shown as an example of remotely sensed trace gas measurements.

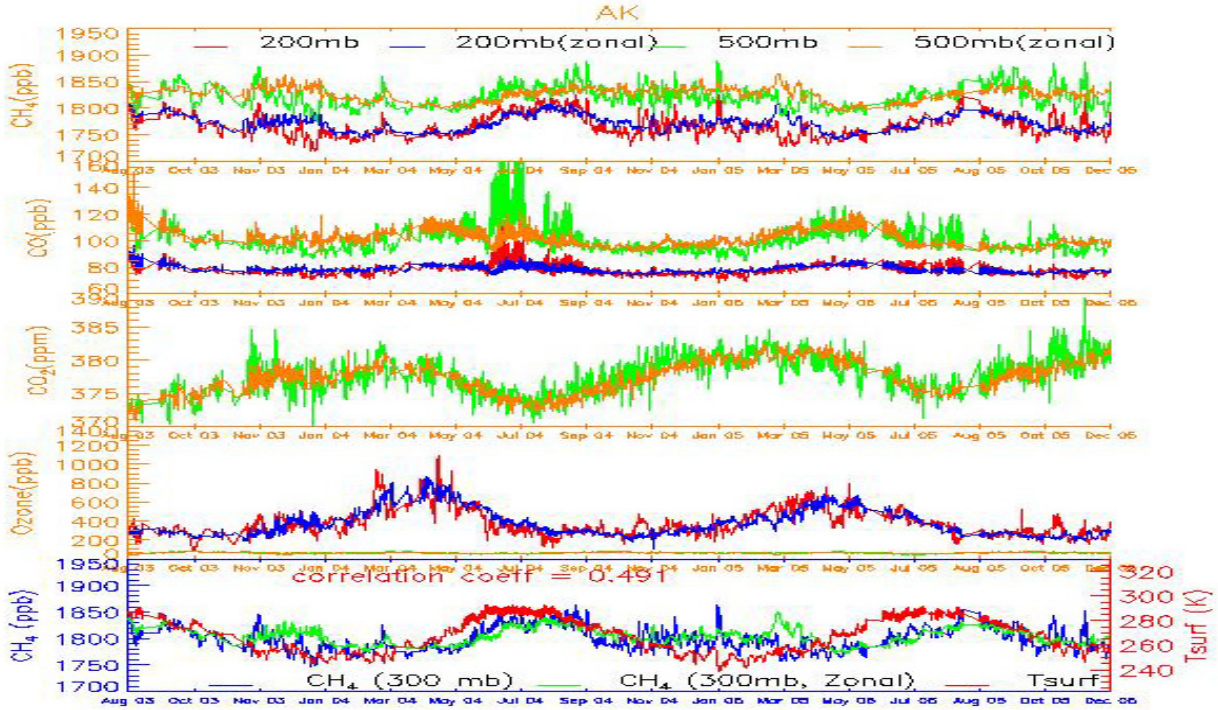

Figure 1. AIRS retrieval of methane (top panel), carbon monoxide (panel 2), carbon dioxide (panel 3), and ozone (panel 4) from August 2003 through Dec. 2005. Retrieved values are shown for the zonal average between 60 to 70 degrees latitude for 200 milli-bar (blue lines) and 500 mb (gold lines) and for the Alaska/Canada region (-165 to -90 latitude) for 200 milli-bar (red) and 500 milli-bar (green). The Alaska forest fires in July of 2004 are evident in the CO time-series as well as the strong seasonal variability of ozone, methane and carbon dioxide. The bottom panel shows the correlation between the seasonal methane signal at 300 mb and surface temperature implying that the release of methane is may be related to wetlands emission in the summer/fall seasons.