Variability of Carbon Monoxide and Other Radiatively Important Trace Gases in the Free Troposphere

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The interactions of carbon monoxide (CO), methane (CH_4), hydroxyl radical (OH), and ozone (O_3) play an important role in the oxidative capacity of the troposphere. In 1999, the Carbon Cycle Greenhouse Gases group at CMDL expanded its surface network to include measurements of the vertical distribution of CO, CO_2, CH_4, and other radiatively important trace gases. Under NASA funding for the Earth Observing System (EOS)/Terra satellite validation, flights above four environmentally diverse sites were begun. The data from this biweekly sampling program provide unique information on the distributions, cycling, and transport of these gases in the free troposphere. At each of the four study locations (Alaska, Massachusetts, Hawaii, and Rarotonga, Cook Islands), considerable structure is observed with altitude (Figure 1). In some cases, back-trajectory analysis suggests the air parcels arriving on site originated over areas of regional pollution; however, in many other cases, the source of the structure is unknown. In this poster, we present examples of the variability observed in the vertical profiles, and the correlation between different species, and discuss the possible reasons for the enhancements/deficits in mixing ratios.

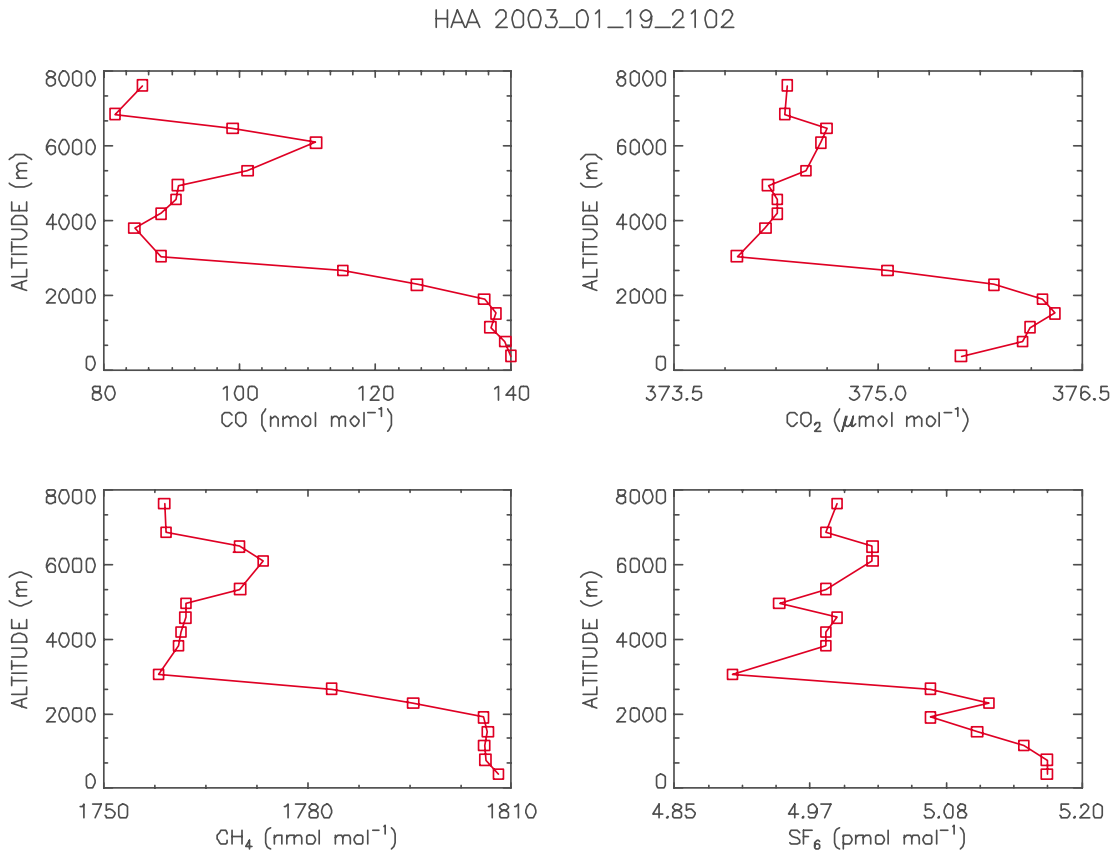

Figure 1. Mixing ratios above Molokai, Hawaii, on January 19, 2003. Enhanced mixing ratios for all species below 2 km and at ~6 km indicate the transport of pollution into the free troposphere.