

Isotopic Studies of Carbon Monoxide at Mauna Loa

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As part of an ongoing program to characterize the chemistry, sources, and seasonality of carbon monoxide in the tropics the Marine Sciences Research Center, State University of New York (SUNY), has been analyzing air samples for CO concentration, $\delta^{13}\text{C}$, $\delta^{18}\text{O}$, and ^{14}C from the Mauna Loa Observatory since October 1998. During the first year CO concentrations (Figure 1a) at Mauna Loa ranged from a minimum of 50 ppb on August 11, 1999, to a maximum of 198 ppb on March 17, 1999, with a yearly averaged concentration of 86 ppb. CO concentration data reveal an asymmetric seasonal cycle with maximum concentrations in the spring and minimum concentrations in the summer. The seasonality of $\delta^{13}\text{C}$ of CO (Figure 1b) generally follows that of CO concentration. Values of $\delta^{13}\text{C}$ peaked during the spring followed by an abrupt decrease in the early summer. Through the late summer, fall and winter, $\delta^{13}\text{C}$ increased

gradually. Comparisons of $\delta^{18}\text{O}$ (Figure 1c) and CO concentrations show a close correlation during all times of the year. Again, $\delta^{18}\text{O}$ values increase during the spring and decrease abruptly in the early summer.

The stable isotope data were used along with the isotopic signatures of the major sources to constrain the relative source strengths over time. The model results combined with back trajectories show the predominant sources are from fossil fuel combustion and biomass burning during the spring maximum, which is in agreement with other studies.

^{14}C is used separately as a tracer of OH abundance. This is based on the fact that the dominant loss rate of ^{14}C is via reaction with OH, and its primary source is cosmogenic. Mauna Loa is only the second tropical site for routine ^{14}C measurements in the northern hemisphere.

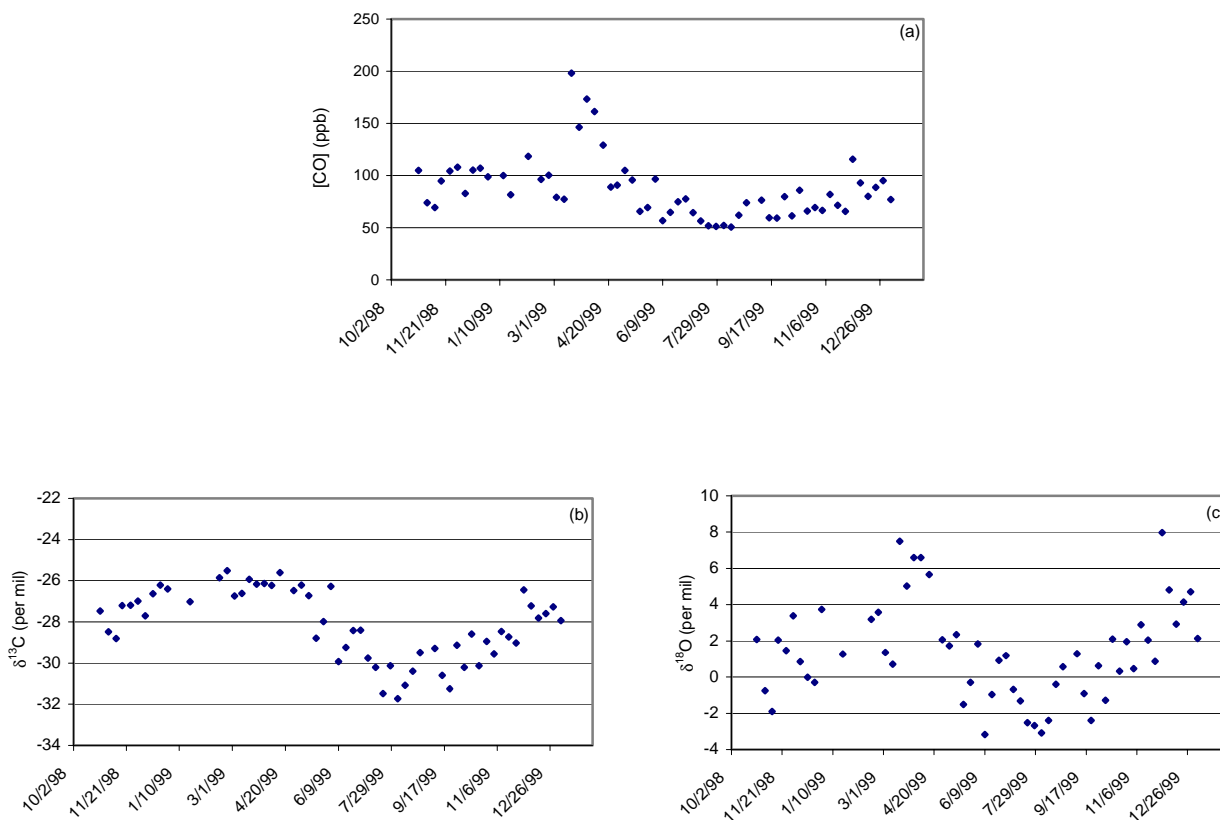


Fig. 1. Time series of (a) CO, (b) $\delta^{13}\text{C}$, and (c) $\delta^{18}\text{O}$ at Mauna Loa, Hawaii, from October 1998 through December 1999.