The CMDL Cooperative Global Air Sampling Network: Expansion and Recent Results

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The most significant result to arise from the CMDL Cooperative Global Air Sampling Network is the existence of a relatively large Northern Hemisphere midlatitude carbon sink [Tans, et al., *Science, 247*, 1431-1438, 1990], a significant fraction of which some studies suggest may be in North America [e.g., Fan et al., *Science, 282*, 442-446, 1998]. To quantify this sink with reasonable certainty is the goal of the North American Carbon Program (NACP), which will be the main thrust of U.S. carbon cycle research for the next decade. A similar effort (EUROCARB) is underway in Europe. At the same time, the CMDL Cooperative Global Air Sampling Network is expanding to provide the global context for NACP and EUROCARB and to better constrain estimates of carbon sources and sinks in large undersampled regions outside Europe and North America. Since 2001 air sampling began at eight new land-based locations and on two container ships in the central Pacific Ocean. Within the next 2 years sampling will be initiated at several new land-based sites, at least one ship in the Atlantic Ocean, and a ship in the Western Pacific Ocean.

Figure 1a shows the globally averaged CO_2 mixing ratio (blue) and the deseasonalized long term trend (red). From 1979 to 2003 the globally averaged CO_2 growth rate is 1.6 ppm yr^{-1} (Figure 1b). The CO_2 growth rates in both 2002 (2.4 ppm yr^{-1}) and 2003 (2.2 ppm yr^{-1}) are greater than the long-term average but not as high as the peak growth rate of 3.4 ppm yr^{-1} in 1998.

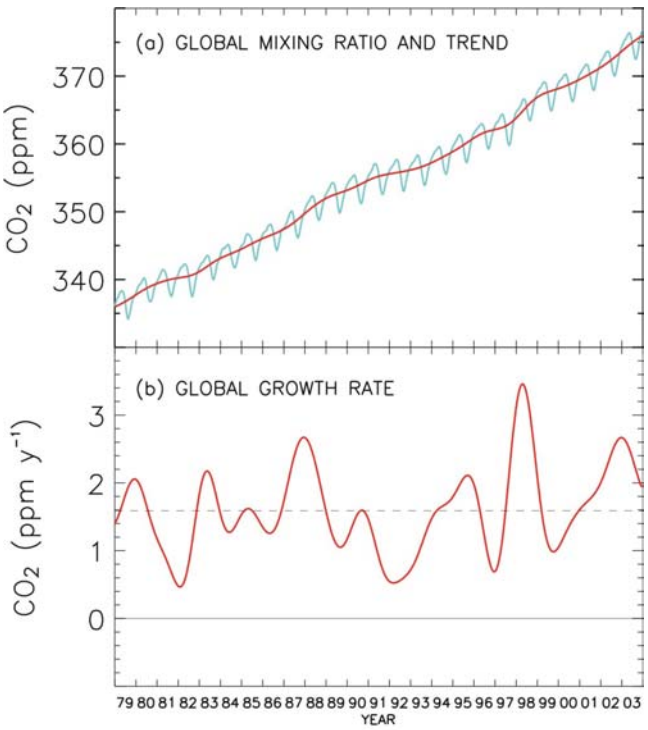

Figure 1(a). The globally averaged CO_2 mixing ratio (blue) and deseasonalized trend (red). (b). The global CO_2 growth rate as a function of time (first derivative of the trend curve

One approach to deducing CO_2 sources and sinks from the data is to perform an inverse calculation with an atmospheric transport model. A three-dimensional transport model (TM3) using analyzed winds and the GLOBALVIEW-CO2 data product, infers a North American sink of -1.4 Gt C yr^{-1}(σ = 0.5), and a European source of 0.7 Gt C yr^{-1} (σ = 0.4) from 1990 to 2000. This calculation used data from 71 sampling locations.