

The Global Direct Radiative Climate Forcing by Well-Mixed Greenhouse Gases over the Past 26 Years – A Climate Benchmark

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Since the pre-industrial era, changes in the well-mixed atmospheric greenhouse gases: carbon dioxide, methane, nitrous oxide and the halocarbons (mainly CFCs), have caused the largest perturbation to radiative climate forcing. Measurements of these gases have minimal scientific uncertainty, being independent of climate models, and thus provide a climate benchmark free of controversy. All of these gases have been monitored around the world since the 1970s mainly by NOAA's Climate Monitoring and Diagnostics Laboratory (CMDL), in Boulder, Colorado, and its forerunner, the Geophysical Monitoring for Climatic Change (GMCC) program. In order to provide the data required, CMDL obtains continuous measurements from five baseline climate observatories at Pt. Barrow, Alaska; Mauna Loa, Hawaii; Trinidad Head, California; American Samoa; and at the South Pole. In addition, flask air samples are collected through several global networks, including a cooperative program for the carbon gases which provides samples from about 100 global clean air sites, including measurements every 5 degrees of latitude from three ship routes. All measurements are relative to world-class gas standards produced by CMDL in Boulder. These data are a product of the CMDL work force and will be presented and analyzed in terms of their changes and the changes in radiative forcing during the 26-year period encompassing 1979 through 2004. An update of the Annual Greenhouse Gas Index, which was introduced at the 2004 CMDL Annual Meeting, will be presented. The importance of the interannual increase in carbon dioxide will be highlighted (Figure 1).

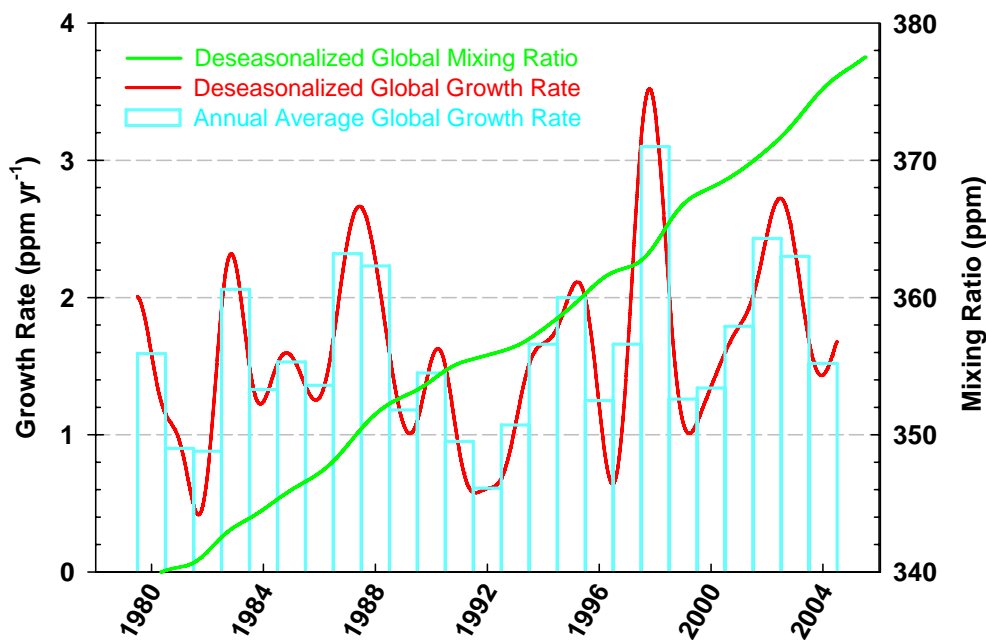


Figure 1. Global carbon dioxide mixing ratio and growth rates from the CMDL cooperative air sampling network.