

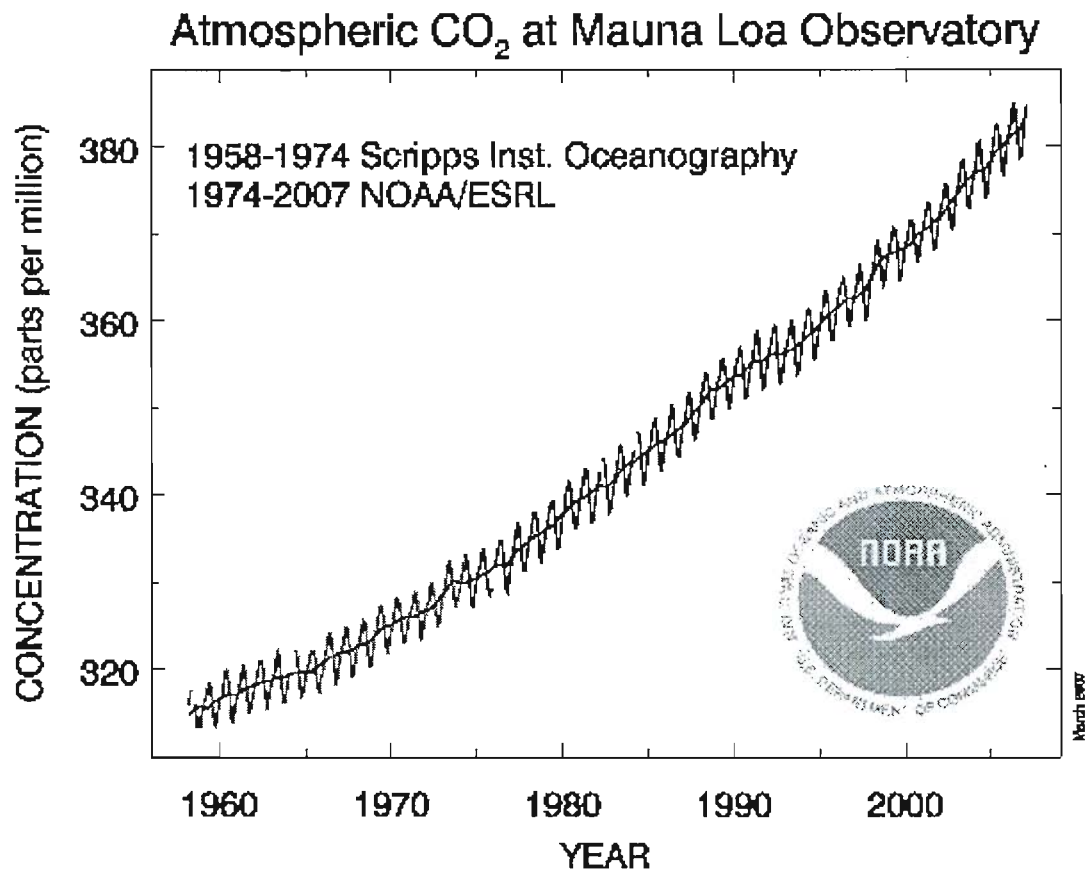
U.S. Department of Commerce | National Oceanic & Atmospheric Administration | NOAA Research



Earth System Research Laboratory

Global Monitoring Division

Atmospheric Carbon Dioxide - Mauna Loa



Monthly mean atmospheric carbon dioxide at Mauna Loa Observatory, Hawaii

The carbon dioxide data, measured as the mole fraction in dry air, on Mauna Loa constitute the longest record of direct measurements of CO₂ in the atmosphere. They were started by C. David Keeling of the Scripps Institution of Oceanography in March of 1958 at a facility of the National Oceanic and Atmospheric Administration (Keeling, 1976). NOAA started its own CO₂ measurements in May of 1974, and they have run in parallel with those made by Scripps since then (Thoning, 1989). The Scripps data are

in blue, the NOAA data in red. The black curve represents the seasonally corrected data smoothed with a 6-month window (Thoning, 1989). Data are reported as a dry mole fraction defined as the number of molecules of carbon dioxide divided by the number of molecules of dry air multiplied by one million (ppm). Click for recent trends in carbon dioxide at **Mauna Loa, Hawaii** and from **the global network**.

Click here for the **Mauna Loa CO₂ monthly mean data**.

How to reference content from this page

Dr. Pieter Tans, NOAA/ESRL (www.esrl.noaa.gov/gmd/ccgg/trends)

Contact

Pieter Tans, NOAA/ESRL, ph. 303 497 6678, Pieter.Tans@noaa.gov

Acknowledgments

Scripps data courtesy of Dr. Ralph Keeling, Scripps Institution of Oceanography, University of California, San Diego.

Further Reading

- C.D. Keeling, R.B. Bacastow, A.E. Bainbridge, C.A. Ekdahl, P.R. Guenther, and L.S. Waterman, Atmospheric carbon dioxide variations at Mauna Loa Observatory, Hawaii, *Tellus*, vol. 28, 538-551, 1976.
- K.W. Thoning, P.P. Tans, and W.D. Komhyr, Atmospheric carbon dioxide at Mauna Loa Observatory 2. Analysis of the NOAA GMCC data, 1974-1985, *J. Geophys. Research*, vol. 94, 8549-8565, 1989.

 USE OF NOAA/ESRL/GMD DATA

These data are made freely available to the public and the scientific community in the belief that their wide dissemination will lead to greater understanding and new scientific insights. The availability of these data does not constitute publication of the data. NOAA relies on the ethics and integrity of the user to assure that GMD receives fair credit for their work. If the data are obtained for potential use in a publication or presentation, GMD should be informed at the outset of the nature of this work. If the GMD data are essential to the work, or if an important result or conclusion depends on the GMD data, co-authorship may be appropriate. This should be discussed at an early stage in the work. Manuscripts using the GMD data should be sent to GMD for review before they are submitted for publication so we can insure that the quality and limitations of the data are accurately represented.

Contact: Pieter Tans (303 497 6678; pieter.tans@noaa.gov)

File Creation: Sat Mar 3 02:55:17 2007

RECIPROCITY

Use of these data implies an agreement to reciprocate. Laboratories making similar measurements agree to make their own data available to the general public and to the scientific community in an equally complete and easily accessible form. Modelers are encouraged to make available to the community, upon request, their own tools used in the interpretation of the GMD data, namely well documented model code, transport fields, and additional information necessary for other scientists to repeat the work and to run modified versions. Model availability includes collaborative support for new users of the models.

Data from March 1958 to April 1974 are from the Scripps Institution of Oceanography (SIO) and where obtained from the Carbon Dioxide Information Analysis Center (CDIAC).

MLO	1958	03	315.71
MLO	1958	04	317.45
MLO	1958	05	317.50
MLO	1958	07	315.86
MLO	1958	08	314.93
MLO	1958	09	313.19
MLO	1958	11	313.34
MLO	1958	12	314.67
MLO	1959	01	315.58
MLO	1959	02	316.47
MLO	1959	03	316.65
MLO	1959	04	317.71
MLO	1959	05	318.29
MLO	1959	06	318.16
MLO	1959	07	316.55
MLO	1959	08	314.80
MLO	1959	09	313.84

MLO	1959	10	313.34
MLO	1959	11	314.81
MLO	1959	12	315.59
MLO	1960	01	316.43
MLO	1960	02	316.97
MLO	1960	03	317.58
MLO	1960	04	319.03
MLO	1960	05	320.03
MLO	1960	06	319.59
MLO	1960	07	318.18
MLO	1960	08	315.91
MLO	1960	09	314.16
MLO	1960	10	313.83
MLO	1960	11	315.00
MLO	1960	12	316.19
MLO	1961	01	316.89
MLO	1961	02	317.70
MLO	1961	03	318.54
MLO	1961	04	319.48
MLO	1961	05	320.58
MLO	1961	06	319.78
MLO	1961	07	318.58
MLO	1961	08	316.79
MLO	1961	09	314.99
MLO	1961	10	315.31
MLO	1961	11	316.10
MLO	1961	12	317.01
MLO	1962	01	317.94
MLO	1962	02	318.56
MLO	1962	03	319.69
MLO	1962	04	320.58
MLO	1962	05	321.01
MLO	1962	06	320.61
MLO	1962	07	319.61
MLO	1962	08	317.40
MLO	1962	09	316.26
MLO	1962	10	315.42
MLO	1962	11	316.69
MLO	1962	12	317.69
MLO	1963	01	318.74
MLO	1963	02	319.08
MLO	1963	03	319.86
MLO	1963	04	321.39
MLO	1963	05	322.24
MLO	1963	06	321.47
MLO	1963	07	319.74
MLO	1963	08	317.77
MLO	1963	09	316.21
MLO	1963	10	315.99
MLO	1963	11	317.07
MLO	1963	12	318.36
MLO	1964	01	319.57
MLO	1964	05	322.23
MLO	1964	06	321.89
MLO	1964	07	320.44
MLO	1964	08	318.70
MLO	1964	09	316.70
MLO	1964	10	316.87
MLO	1964	11	317.68
MLO	1964	12	318.71

MLO	1965	01	319.44
MLO	1965	02	320.44
MLO	1965	03	320.89
MLO	1965	04	322.13
MLO	1965	05	322.16
MLO	1965	06	321.87
MLO	1965	07	321.21
MLO	1965	08	318.87
MLO	1965	09	317.81
MLO	1965	10	317.30
MLO	1965	11	318.87
MLO	1965	12	319.42
MLO	1966	01	320.62
MLO	1966	02	321.59
MLO	1966	03	322.39
MLO	1966	04	323.70
MLO	1966	05	324.07
MLO	1966	06	323.75
MLO	1966	07	322.40
MLO	1966	08	320.37
MLO	1966	09	318.64
MLO	1966	10	318.10
MLO	1966	11	319.79
MLO	1966	12	321.03
MLO	1967	01	322.33
MLO	1967	02	322.50
MLO	1967	03	323.04
MLO	1967	04	324.42
MLO	1967	05	325.00
MLO	1967	06	324.09
MLO	1967	07	322.55
MLO	1967	08	320.92
MLO	1967	09	319.26
MLO	1967	10	319.39
MLO	1967	11	320.72
MLO	1967	12	321.96
MLO	1968	01	322.57
MLO	1968	02	323.15
MLO	1968	03	323.89
MLO	1968	04	325.02
MLO	1968	05	325.57
MLO	1968	06	325.36
MLO	1968	07	324.14
MLO	1968	08	322.11
MLO	1968	09	320.33
MLO	1968	10	320.25
MLO	1968	11	321.32
MLO	1968	12	322.90
MLO	1969	01	324.00
MLO	1969	02	324.42
MLO	1969	03	325.64
MLO	1969	04	326.66
MLO	1969	05	327.38
MLO	1969	06	326.70
MLO	1969	07	325.89
MLO	1969	08	323.67
MLO	1969	09	322.38
MLO	1969	10	321.78
MLO	1969	11	322.85
MLO	1969	12	324.12

MLO	1970	01	325.06
MLO	1970	02	325.98
MLO	1970	03	326.93
MLO	1970	04	328.13
MLO	1970	05	328.07
MLO	1970	06	327.66
MLO	1970	07	326.35
MLO	1970	08	324.69
MLO	1970	09	323.10
MLO	1970	10	323.07
MLO	1970	11	324.01
MLO	1970	12	325.13
MLO	1971	01	326.17
MLO	1971	02	326.68
MLO	1971	03	327.18
MLO	1971	04	327.78
MLO	1971	05	328.92
MLO	1971	06	328.57
MLO	1971	07	327.37
MLO	1971	08	325.43
MLO	1971	09	323.36
MLO	1971	10	323.56
MLO	1971	11	324.80
MLO	1971	12	326.01
MLO	1972	01	326.77
MLO	1972	02	327.63
MLO	1972	03	327.75
MLO	1972	04	329.72
MLO	1972	05	330.07
MLO	1972	06	329.09
MLO	1972	07	328.05
MLO	1972	08	326.32
MLO	1972	09	324.84
MLO	1972	10	325.20
MLO	1972	11	326.50
MLO	1972	12	327.55
MLO	1973	01	328.54
MLO	1973	02	329.56
MLO	1973	03	330.30
MLO	1973	04	331.50
MLO	1973	05	332.48
MLO	1973	06	332.07
MLO	1973	07	330.87
MLO	1973	08	329.31
MLO	1973	09	327.51
MLO	1973	10	327.18
MLO	1973	11	328.16
MLO	1973	12	328.64
MLO	1974	01	329.35
MLO	1974	02	330.71
MLO	1974	03	331.48
MLO	1974	04	332.65
MLO	1974	05	333.16
MLO	1974	06	332.06
MLO	1974	07	330.99
MLO	1974	08	329.17
MLO	1974	09	327.41
MLO	1974	10	327.20
MLO	1974	11	328.33
MLO	1974	12	329.50

MLO	1975	01	330.68
MLO	1975	02	331.41
MLO	1975	03	331.85
MLO	1975	04	333.29
MLO	1975	05	333.91
MLO	1975	06	333.40
MLO	1975	07	331.78
MLO	1975	08	329.88
MLO	1975	09	328.57
MLO	1975	10	328.46
MLO	1975	11	329.26
MLO	1976	01	331.71
MLO	1976	02	332.76
MLO	1976	03	333.48
MLO	1976	04	334.78
MLO	1976	05	334.78
MLO	1976	06	334.17
MLO	1976	07	332.78
MLO	1976	08	330.64
MLO	1976	09	328.95
MLO	1976	10	328.77
MLO	1976	11	330.23
MLO	1976	12	331.69
MLO	1977	01	332.70
MLO	1977	02	333.24
MLO	1977	03	334.96
MLO	1977	04	336.04
MLO	1977	05	336.82
MLO	1977	06	336.13
MLO	1977	07	334.73
MLO	1977	08	332.52
MLO	1977	09	331.19
MLO	1977	10	331.19
MLO	1977	11	332.35
MLO	1977	12	333.47
MLO	1978	01	335.11
MLO	1978	02	335.26
MLO	1978	03	336.60
MLO	1978	04	337.77
MLO	1978	05	338.00
MLO	1978	06	337.99
MLO	1978	07	336.48
MLO	1978	08	334.37
MLO	1978	09	332.27
MLO	1978	10	332.41
MLO	1978	11	333.76
MLO	1978	12	334.83
MLO	1979	01	336.21
MLO	1979	02	336.64
MLO	1979	03	338.12
MLO	1979	04	339.02
MLO	1979	05	339.02
MLO	1979	06	339.20
MLO	1979	07	337.58
MLO	1979	08	335.55
MLO	1979	09	333.89
MLO	1979	10	334.14
MLO	1979	11	335.26
MLO	1979	12	336.71
MLO	1980	01	337.81

MLO	1980	02	338.29
MLO	1980	03	340.04
MLO	1980	04	340.86
MLO	1980	05	341.47
MLO	1980	06	341.26
MLO	1980	07	339.29
MLO	1980	08	337.60
MLO	1980	09	336.12
MLO	1980	10	336.08
MLO	1980	11	337.22
MLO	1980	12	338.34
MLO	1981	01	339.36
MLO	1981	02	340.51
MLO	1981	03	341.57
MLO	1981	04	342.56
MLO	1981	05	343.01
MLO	1981	06	342.47
MLO	1981	07	340.71
MLO	1981	08	338.52
MLO	1981	09	336.96
MLO	1981	10	337.13
MLO	1981	11	338.58
MLO	1981	12	339.89
MLO	1982	01	340.93
MLO	1982	02	341.69
MLO	1982	03	342.69
MLO	1982	05	344.30
MLO	1982	06	343.43
MLO	1982	07	341.88
MLO	1982	08	339.89
MLO	1982	09	337.95
MLO	1982	10	338.10
MLO	1982	11	339.27
MLO	1982	12	340.67
MLO	1983	01	341.42
MLO	1983	02	342.68
MLO	1983	03	343.46
MLO	1983	04	345.10
MLO	1983	05	345.76
MLO	1983	06	345.36
MLO	1983	07	343.91
MLO	1983	08	342.05
MLO	1983	09	340.00
MLO	1983	10	340.12
MLO	1983	11	341.33
MLO	1983	12	342.94
MLO	1984	01	343.87
MLO	1984	02	344.60
MLO	1984	03	345.20
MLO	1984	05	347.36
MLO	1984	06	346.74
MLO	1984	07	345.41
MLO	1984	08	343.01
MLO	1984	09	341.23
MLO	1984	10	341.52
MLO	1984	11	342.86
MLO	1984	12	344.41
MLO	1985	01	345.09
MLO	1985	02	345.89
MLO	1985	03	347.49

MLO	1985	04	348.00
MLO	1985	05	348.75
MLO	1985	06	348.19
MLO	1985	07	346.54
MLO	1985	08	344.63
MLO	1985	09	343.03
MLO	1985	10	342.92
MLO	1985	11	344.24
MLO	1985	12	345.62
MLO	1986	01	346.43
MLO	1986	02	346.94
MLO	1986	03	347.88
MLO	1986	04	349.57
MLO	1986	05	350.35
MLO	1986	06	349.72
MLO	1986	07	347.78
MLO	1986	08	345.86
MLO	1986	09	344.84
MLO	1986	10	344.32
MLO	1986	11	345.67
MLO	1986	12	346.88
MLO	1987	01	348.19
MLO	1987	02	348.55
MLO	1987	03	349.52
MLO	1987	04	351.12
MLO	1987	05	351.84
MLO	1987	06	351.49
MLO	1987	07	349.82
MLO	1987	08	347.63
MLO	1987	09	346.38
MLO	1987	10	346.49
MLO	1987	11	347.75
MLO	1987	12	349.03
MLO	1988	01	350.20
MLO	1988	02	351.61
MLO	1988	03	352.22
MLO	1988	04	353.53
MLO	1988	05	354.14
MLO	1988	06	353.62
MLO	1988	07	352.53
MLO	1988	08	350.41
MLO	1988	09	348.84
MLO	1988	10	348.94
MLO	1988	11	350.04
MLO	1988	12	351.29
MLO	1989	01	352.72
MLO	1989	02	353.10
MLO	1989	03	353.65
MLO	1989	04	355.43
MLO	1989	05	355.70
MLO	1989	06	355.11
MLO	1989	07	353.79
MLO	1989	08	351.42
MLO	1989	09	349.81
MLO	1989	10	350.11
MLO	1989	11	351.26
MLO	1989	12	352.63
MLO	1990	01	353.64
MLO	1990	02	354.72
MLO	1990	03	355.49

MLO	1990	04	356.09
MLO	1990	05	357.08
MLO	1990	06	356.11
MLO	1990	07	354.70
MLO	1990	08	352.68
MLO	1990	09	351.05
MLO	1990	10	351.36
MLO	1990	11	352.81
MLO	1990	12	354.22
MLO	1991	01	354.85
MLO	1991	02	355.66
MLO	1991	03	357.04
MLO	1991	04	358.40
MLO	1991	05	359.00
MLO	1991	06	357.99
MLO	1991	07	356.00
MLO	1991	08	353.78
MLO	1991	09	352.20
MLO	1991	10	352.22
MLO	1991	11	353.70
MLO	1991	12	354.98
MLO	1992	01	356.09
MLO	1992	02	356.85
MLO	1992	03	357.73
MLO	1992	04	358.91
MLO	1992	05	359.45
MLO	1992	06	359.19
MLO	1992	07	356.72
MLO	1992	08	354.79
MLO	1992	09	352.79
MLO	1992	10	353.20
MLO	1992	11	354.15
MLO	1992	12	355.39
MLO	1993	01	356.77
MLO	1993	02	357.17
MLO	1993	03	358.26
MLO	1993	04	359.16
MLO	1993	05	360.07
MLO	1993	06	359.41
MLO	1993	07	357.44
MLO	1993	08	355.30
MLO	1993	09	353.87
MLO	1993	10	354.04
MLO	1993	11	355.27
MLO	1993	12	356.70
MLO	1994	01	358.00
MLO	1994	02	358.81
MLO	1994	03	359.68
MLO	1994	04	361.13
MLO	1994	05	361.48
MLO	1994	06	360.60
MLO	1994	07	359.20
MLO	1994	08	357.23
MLO	1994	09	355.42
MLO	1994	10	355.89
MLO	1994	11	357.41
MLO	1994	12	358.74
MLO	1995	01	359.73
MLO	1995	02	360.61
MLO	1995	03	361.58

MLO	1995	04	363.05
MLO	1995	05	363.62
MLO	1995	06	363.03
MLO	1995	07	361.55
MLO	1995	08	358.94
MLO	1995	09	357.93
MLO	1995	10	357.80
MLO	1995	11	359.22
MLO	1995	12	360.44
MLO	1996	01	361.83
MLO	1996	02	362.95
MLO	1996	03	363.91
MLO	1996	04	364.28
MLO	1996	05	364.94
MLO	1996	06	364.70
MLO	1996	07	363.31
MLO	1996	08	361.15
MLO	1996	09	359.40
MLO	1996	10	359.34
MLO	1996	11	360.62
MLO	1996	12	361.96
MLO	1997	01	362.81
MLO	1997	02	363.87
MLO	1997	03	364.25
MLO	1997	04	366.02
MLO	1997	05	366.46
MLO	1997	06	365.32
MLO	1997	07	364.07
MLO	1997	08	361.95
MLO	1997	09	360.06
MLO	1997	10	360.49
MLO	1997	11	362.19
MLO	1997	12	364.12
MLO	1998	01	364.99
MLO	1998	02	365.82
MLO	1998	03	366.95
MLO	1998	04	368.42
MLO	1998	05	369.33
MLO	1998	06	368.78
MLO	1998	07	367.59
MLO	1998	08	365.84
MLO	1998	09	363.83
MLO	1998	10	364.18
MLO	1998	11	365.34
MLO	1998	12	366.93
MLO	1999	01	367.94
MLO	1999	02	368.82
MLO	1999	03	369.46
MLO	1999	04	370.77
MLO	1999	05	370.66
MLO	1999	06	370.10
MLO	1999	07	369.08
MLO	1999	08	366.66
MLO	1999	09	364.60
MLO	1999	10	365.17
MLO	1999	11	366.51
MLO	1999	12	367.89
MLO	2000	01	369.04
MLO	2000	02	369.35
MLO	2000	03	370.38

MLO	2000	04	371.63
MLO	2000	05	371.32
MLO	2000	06	371.53
MLO	2000	07	369.75
MLO	2000	08	368.23
MLO	2000	09	366.87
MLO	2000	10	366.94
MLO	2000	11	368.27
MLO	2000	12	369.64
MLO	2001	01	370.46
MLO	2001	02	371.44
MLO	2001	03	372.37
MLO	2001	04	373.33
MLO	2001	05	373.77
MLO	2001	06	373.09
MLO	2001	07	371.51
MLO	2001	08	369.55
MLO	2001	09	368.12
MLO	2001	10	368.38
MLO	2001	11	369.66
MLO	2001	12	371.11
MLO	2002	01	372.36
MLO	2002	02	373.09
MLO	2002	03	373.81
MLO	2002	04	374.93
MLO	2002	05	375.58
MLO	2002	06	375.44
MLO	2002	07	373.86
MLO	2002	08	371.77
MLO	2002	09	370.73
MLO	2002	10	370.50
MLO	2002	11	372.18
MLO	2002	12	373.70
MLO	2003	01	374.92
MLO	2003	02	375.62
MLO	2003	03	376.51
MLO	2003	04	377.75
MLO	2003	05	378.54
MLO	2003	06	378.20
MLO	2003	07	376.68
MLO	2003	08	374.43
MLO	2003	09	373.11
MLO	2003	10	373.10
MLO	2003	11	374.77
MLO	2003	12	375.97
MLO	2004	01	377.03
MLO	2004	02	377.87
MLO	2004	03	378.88
MLO	2004	04	380.42
MLO	2004	05	380.62
MLO	2004	06	379.70
MLO	2004	07	377.43
MLO	2004	08	376.32
MLO	2004	09	374.19
MLO	2004	10	374.47
MLO	2004	11	376.15
MLO	2004	12	377.51
MLO	2005	01	378.43
MLO	2005	02	379.70
MLO	2005	03	380.92

MLO	2005	04	382.18
MLO	2005	05	382.45
MLO	2005	06	382.14
MLO	2005	07	380.60
MLO	2005	08	378.64
MLO	2005	09	376.73
MLO	2005	10	376.84
MLO	2005	11	378.29
MLO	2005	12	380.06
MLO	2006	01	381.40
MLO	2006	02	382.20
MLO	2006	03	382.66
MLO	2006	04	384.68
MLO	2006	05	384.94
MLO	2006	06	384.02
MLO	2006	07	382.14
MLO	2006	08	380.31
MLO	2006	09	378.81
MLO	2006	10	378.99
MLO	2006	11	380.17
MLO	2006	12	382.43
MLO	2007	01	383.84
MLO	2007	02	384.87