Atmospheric $\text{CO}_2$ evolution over the Cenozoic

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and the

Research Coordination Network on Improving reconstructions of Cenozoic $p\text{CO}_2$ change

and

paleopCO$_2$.org
A Scientifically Rigorous and Accessible $\text{CO}_2$ ‘Keeling Curve’ for Geologic Time
Paleo-pCO$_2$ database Archive

(a) Surface temperature (°C) over millions of years ago. Adapted from Hansen et al. (2013).

(b) pCO$_2$ (µatm) and Age (thousands of years ago).

(c) Various proxy data including phytoplankton, boron isotopes, B/Ca, stomatal index, stomatal ratio, C3 plants, leaf gas exchange ROM, leaf gas exchange Franks, leaf gas exchange FOM, liverwort/Bryocarb, paleosol, nahcolite + halite.

(d) Mauna Loa atmospheric measurements and ice cores.
Expert-vetted data compilation

(a) Surface temperature (°C) over millions of years ago, showing changes in surface temperature with time. Hansen et al. (2013) plotted the data, with paleoclimatic events such as the Paleocene-Eocene Thermal Maximum (PETM) highlighted.

(b) Carbon dioxide (pCO₂) over thousands of years ago, with a concentration scale from 800 to 3000 µatm, indicating variability in atmospheric CO₂ levels over time.

(c) Carbon dioxide (pCO₂) over millions of years ago, with a concentration scale from 35 to 65, showing fluctuations in atmospheric CO₂ levels over time.

(d) Carbon dioxide (pCO₂) over thousands of years ago, with a concentration scale from 0 to 500, highlighting atmospheric measurements and ice cores, with Mauna Loa atmospheric measurements and ice cores marked.
Bayesian interpolation of uncertain data

Product data, prior corr. length=5 Ma, 2σ uncertainties.
Mid-Pleistocene transition in glacial cycles explained by declining CO₂ and regolith removal

M. Willeit¹*, A. Ganopolski¹, R. Calov¹, V. Bovkin²

Sciences Advances, 2019

“We show that gradual lowering of atmospheric CO₂ and regolith removal are essential to reproduce the evolution of climate variability of the Quaternary.”

290 ppm, typical of the past 800 ka, at ~1 Ma ago (Fig. 2D). The amplitude of glacial-interglacial CO₂ variations increases from ~50 ppm at the beginning of the Quaternary to ~80 to 90 ppm during the 100-ka cycles of the past million years. This suggests that, for the early Quaternary, the large spreading between and within different CO₂ reconstructions markedly overestimates real CO₂ variability. In
Dynamic Greenland ice sheet driven by pCO$_2$ variations across the Pliocene Pleistocene transition

Ning Tan$^{1,2}$, Jean-Baptiste Ladant$^{1,3,4}$, Gilles Ramstein$^{1}$, Christophe Dumas$^{1}$, Paul Bachem$^{5}$ & Eystein Jansen$^{6}$

Nature Communications, 2018
paleopCO$_2$.org – A Scientifically Rigorous and Accessible CO$_2$ ‘Keeling Curve’ for Geologic Time

Figures of original paleo-pCO$_2$ records and vetted compilation, documentation of quarantined data

Data and reference downloads

Guidelines for data submission, data spreadsheets, error calculation routines

Videos, animations

FAQs