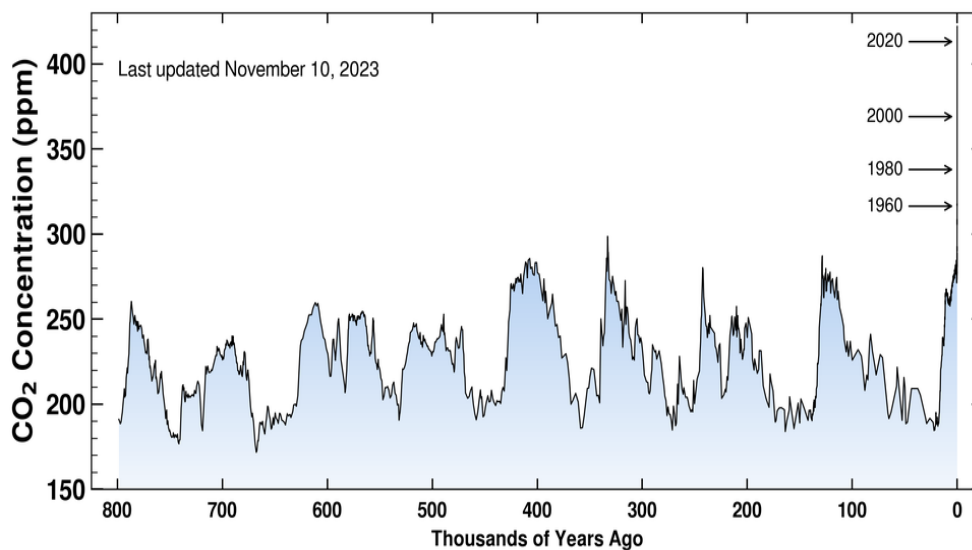


## The Keeling Curve II - CO<sub>2</sub> Levels in Context

2023-11-22 8:30 AM Version. Norris Whiston, Earltown NS norrisw@ns.sympatico.ca. More at [NW Guides & Keys | Nova Scotia Wild Flora Society](#)



Ages: MIS16 MIS11 MIS9 MIS5e MIS2 MIS1

CO<sub>2</sub> in ancient snow bubbles [British Antarctic Survey](#); latest CO<sub>2</sub> [Keelingcurve.ucsd.edu](#); Ages – MIS: <sup>18</sup>O/<sup>16</sup>O in [sea fossils](#). All stages see [Marine Isotope Stages](#).

Following daily, yearly, and long-term changes in closeness and visibility to the sun, Earth has experienced variations in its global temperature. Those long-term changes have been explained by [Dr. Paul Merrill](#) and [Dr. Dan Britt](#).

From those variations, longer cold periods became glacial stages and the warm periods became interglacial stages.

Earth's atmosphere has mostly non-heat producing nitrogen (N<sub>2</sub>) and oxygen (O<sub>2</sub>). Their atmospheric molecules allow infrared light (long wave light reemitted from Earth) to pass without affect. Some atmospheric gases have three or more atoms, like water H<sub>2</sub>O, nitrous oxide N<sub>2</sub>O, carbon dioxide CO<sub>2</sub>, and methane CH<sub>4</sub>. [These gases behave differently](#).

In 1856, Eunice Newton Foote [discovered](#) that CO<sub>2</sub>, when set in the sun, warms and holds in heat. Thanks to nature's biogeochemical processing, including photosynthesis, Earth had cleared lots of its former CO<sub>2</sub> and stored it safely away in plants, soil, coal, oil, gas, rocks, water, shells, or corals. Recently, Earth's air, land and oceans have been getting warmer as a consequence of reconverting those previous stores back into "greenhouse gases" by deforestation, exposing soils, melting permafrost, or burning carbon fuels, including biomass and biofuels. [Humans began that reversal](#) 8000 ya.

**Below, and in the above graph, are some of Earth's glacial (ice ages) and interglacial stages (warm ages).**

MIS16 676,000 ya – 621,000 ya - [Don Glaciation](#). 175 ppm. Extreme glaciation extended down the Don River in Russia.

MIS11 424,000 ya – 374,000 ya - Interglacial. During MIS 11, the atmospheric carbon was between 265 and 280 ppm (parts per million) and Earth's seas had risen between 6 and 12 meters (20 to 40 feet) above present levels. In the 1960s, in northwestern Greenland, below an ice core of 1390 meters (4560 feet) was found willow, moss, eight-petal mountain avens, and sedges. The top of the soil was dated to 416,000 ya and the soil had been exposed for less than 14,000 yrs. [Bierman & Rittenour 23 July 2023 Phys.Org News](#) In [southern Greenland](#), found was "grain, yew, alder, pine" and "buzzing insects". With those sea levels, [this period](#) was similar to the [Pliocene megabiome](#).

MIS9 337,000 ya – 300,000 ya - Interglacial. [MIS9](#) consisted of two [interstadial](#) (warm periods) and one [stadial](#) period.

MIS5e 125,000 ya – 118,000 ya - Last Interglacial. During this period, atmospheric carbon reached 285 ppm.

"Temperatures were up to 1°C higher than today—similar to those projected for the near future." "Sea levels rose 10 metres [30 feet] above present levels" Research has shown "that melting ice from Antarctica was the main driver of sea level rise." "The ice melted first in Antarctica, then a few thousand years later in Greenland. Sea levels rose at up to 3 metres per century" "This meltwater changed the way Earth's oceans circulated. which caused warming in the northern polar region and triggered ice melt in Greenland." This stage lasted about 10,000 years. [Fiona Hibbert, The Conversation, 7 Nov. 2019 Phys.Org News](#)

MIS2 26,000 ya – 20,000 ya - [Last Glacial Max](#). 185 ppm. "What is more certain is that only 21,000 years ago, the Earth was 3.0-4.0 C colder than today." "At that time, New York [and Seattle] were covered in ice one kilometre thick, with Norway under three kilometres and sea levels 120 metres lower than now," Didier Roche, France's National Centre for Scientific Research. [AFP 29 Nov. 2019 "Scientists scour past for future climate clues." Phys.Org News](#)

MIS1 12,000 ya – Present Interglacial - Holocene. 8000 ya, carbon dioxide, due to forestry and agriculture, diverged from the historical / Milankovitch time line. 5000 ya, methane, with livestock domestication and rice cultivation, diverged from methane's historical time line. [Dr. Dan Britt: Orbits and Ice Ages after 29:55](#)

May 2023. Earth's atmos. CO<sub>2</sub> reached [424 ppm](#).

[Referenced videos UN-approved. Data can also found in NASA & [NOAA datasets](#)]