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Is Glacial Burial Carbon the Missing Link in the Glacial-Interglacial Atmospheric CO2 Changes

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Organic carbon buried under the great ice sheets of the Northern Hemisphere is suggested to be the missing link in the atmospheric CO_2 change over the glacial-interglacial cycles. At glaciation, the advancement of continental ice sheets buries vegetation and soil carbon accumulated during warmer periods. At deglaciation, this burial carbon is released back into the atmosphere. In a simulation over two glacial-interglacial cycles using a synchronously coupled atmosphere-land-ocean carbon model forced by reconstructed climate change, I found a 547 Gt terrestrial carbon release from glacial maximum to interglacial, resulting in a 60 Gt (about 30 ppmv) increase in the atmospheric CO_2, with the remainder absorbed by the ocean in a scenario in which ocean acts as a passive buffer. This is in contrast to previous estimates of a land uptake at deglaciation. This carbon source originates from glacial burial, continental shelf and other land areas in response to changes in ice cover, sea level, and climate. The input of light isotope enriched terrestrial carbon causes atmospheric δ^{13}C to drop by about 0.3at deglaciation, followed by rapid rise towards a high interglacial value in response to oceanic warming and regrowth on land. Together with other ocean based mechanisms such as change in ocean temperature, the glacial burial hypothesis may offer a full explanation of the observed 80-100 ppmv atmospheric CO_2 change.