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Characterization of in situ cosmogenic 14CO in glacial ice and applications of ice core 14CO as a tracer

Content

Carbon-14 (14C) is included in glacial ice via trapping of air and in situ cosmogenic production. In the carbon monoxide phase (14CO), ice core 14C has two promising applications. First, the trapped atmospheric component of 14CO has the potential to serve as a tracer of past hydroxyl radical (OH) abundance and variability. Second, the in situ cosmogenic component can in principle be used to reconstruct variations in the past flux of galactic cosmic rays. A detailed understanding of the in situ cosmogenic 14CO production and retention in ice is needed to disentangle the trapped atmospheric and in situ cosmogenic components in measurements of ice core 14CO. We will present the most recent interpretations of ice core 14CO measurements from Taylor Glacier, Antarctica and Summit, Greenland. Taylor Glacier is an ablation site with easily accessible ancient (>50 kyr) ice at the surface that allows for the determination of in situ cosmogenic 14CO production rates in the absence of a trapped atmospheric component. Summit is a traditional ice coring site that allows for the examination of how well in situ cosmogenic 14CO is retained in the firn. The results form the basis for the interpretation of new measurements from Law Dome, Antarctica, which are aimed at reconstructing paleoatmospheric 14CO. The results also support the feasibility of using 14CO measurements at a low-accumulation site such as Dome C, Antarctica to study past variations in the galactic cosmic ray flux.

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