
Holocene ice cap dynamics reconstructed from ¹⁴C-dated moss and mammal bones currently emerging along receding ice margins

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Receding cold-based ice caps in the Canadian Arctic steadily uncover fossil fauna and flora that were entombed during ice expansion. The exceptionally warm summer of 2009 on Baffin Island resulted in ice marginal retreat exposing numerous patches of dead vegetation and faunal remains. We collected and microscopically analysed 65 samples and radiocarbon dated 47 of them: 44 plants and 3 caribou bones. A few samples were observed to include green bryophytes or algae and were not submitted because they may contain modern admixtures.

The dated moss and caribou bones reveal several distinct phases of Holocene ice cap expansion. The first expansion started about 4.7 cal ka and continued until 3.2 cal ka. The following hiatus of dates between 3.2–1.9 cal ka indicates a continuous ice cover at these high elevations (> 800 m). Ice caps then receded or completely melted before expanding again between 1.9–1.1 cal ka, followed by a short interval of stability and recession above these elevations before the final phase of expansion starting after 0.75 cal ka.

Steady cooling during the Holocene facilitated the onset of the Neoglaciation at around 4.7 cal ka. The second hiatus (1.1–0.75 cal ka) corresponds to the Medieval Warm Period (1000–700 BP), which supports the hypothesis that the hiatus represent recessions. The last episode of ice cap growth coincides with the Little Ice Age (400–100 BP), which is nowadays visible as decameter-wide lichen-kill zones around ice caps. Future work will analyse the links between ice cap expansion and changes in regional atmospheric and oceanic circulation, solar insolation, and volcanic activity.