Late glacial-early Holocene fluctuations of Greenland Ice Sheet outlet glaciers and adjacent local ice caps in central east Greenland

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Recent rapid fluctuations of Greenland Ice Sheet outlet glaciers have alarmed scientists and the public alike. These outlet glacier fluctuations may result from the internal mechanics of tidewater glaciers or the influence of ocean-water temperatures on glacial melting. In contrast, it is generally assumed that fluctuations of small glaciers and ice caps are influenced mainly by summer temperatures and, to a lesser amount, winter precipitation. Here we show that during late glacial and early Holocene time Greenland Ice Sheet outlet glacier fluctuations occurred at the same time as small glacier and ice cap fluctuations in central east Greenland.

Our work in the Scoresby Sund region of central east Greenland uses equilibrium line altitudes determined from past glacier and ice cap extents to estimate summer temperatures during late glacial and early Holocene time. A chronology of these past glacier and ice cap extents is based on surface-exposure (^{10}Be) dating of moraines and a radiocarbon-dated relative sea level curve. In this same area, we apply ^{10}Be dating to determine a chronology of past extents of Greenland Ice Sheet outlet glaciers. We present ^{10}Be ages of moraines deposited by an outlet of the Greenland Ice Sheet in southeastern Milne Land and ^{10}Be ages of moraines deposited by an adjacent local ice cap. Mean ages of both moraines are ~11.6 ka, indicating deposition at the end of the Younger Dryas cold event. In addition, ^{10}Be ages of boulders outboard of the moraines indicate ice recession during Younger Dryas time.