

Holocene and Little Ice Age Glacier and Temperature Change in the Arctic

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Abstract

The Holocene, the warm-period of the last ~11,500 years, is a particularly important climate period because the natural climate variability defines the baseline against which ongoing climate and environmental change is evaluated. Glaciers are key elements of the environment, particularly sensitive to climate changes and hence are extremely vulnerable in face of a warming world (IPCC report 2007; (Solomon et al., 2007)). Despite of obvious relevance, the response of the Earth's cryosphere to changing climate remains poorly constrained. The Arctic is the area of fastest cryosphere change globally (Arctic Climate Impact Assessment, 2005; (Report, 2005)), but we know little about past changes of glaciers there, primarily because it has been largely impossible to precisely date past glacier change. Recent progress in ¹⁰Be surface exposure dating now affords an ability to date moraines as young as 100 years, and provides an unprecedented opportunity to greatly improve our understanding of glacier change in the Arctic.

Here we propose to map and date some of the best resolved and preserved Holocene moraine records in the Arctic, on Baffin Island, Arctic Canada. We are tackling this task with a team that has more than ten years experience working in this area. We will use the moraine chronologies to derive a Holocene glacier change record for this area that we expect will cover several thousand years, including the Little Ice Age period (LIA: CE 1300-1850). These will be the first data of their kind in the Arctic and will enhance our understanding of Arctic glacier sensitivity to changing temperatures, a key parameter for evaluating the stability of ice sheets such as the neighboring Greenland Ice Sheet, where the mass-loss is dominated at outlet glaciers.