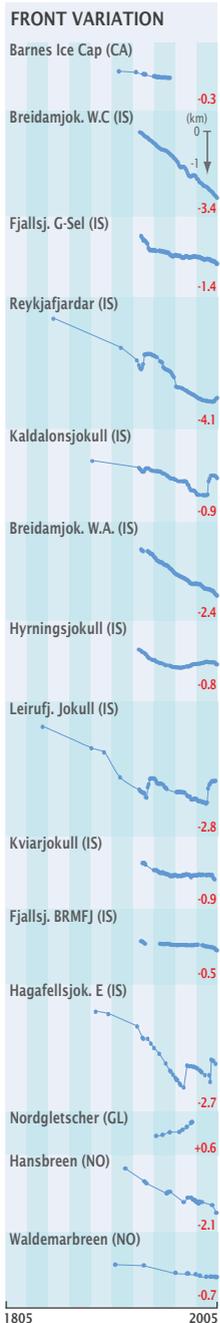


## 6.11 Arctic Islands

Glaciers and ice caps are found on the Canadian Arctic Archipelago and around the Greenland Ice Sheet, as well as on the West Arctic Islands, Iceland, and Svalbard. The majority of the fluctuation measurements have been reported from the latter two regions.



The Arctic Islands consist of Greenland, the Canadian Arctic Archipelago to the west, Iceland, Svalbard and the West Arctic Islands, as well as the East Arctic Islands (see section Northern Asia) to the east. More than half of the area covered by glaciers and ice caps (~ 150 000 km<sup>2</sup>) is located on the Canadian Arctic Archipelago, which is a group of more than 36 000 islands (e.g. Baffin, Devon, Ellesmere, and Axel Heiberg Island), and another quarter is found around the Greenland ice sheet. Iceland is located on the Mid-Atlantic Ridge, the boundary of the European and the American plates, with its ice cover dominated by six large ice caps, with Vatnajökull as the largest. The Svalbard Archipelago is situated in the Arctic Ocean north of mainland Europe. Its topography is more than half covered by ice, and is characterized by plateau mountains and fjords. The climate and as such the fluctuations of glaciers and ice caps of the Arctic Islands are very much influenced by the extent and distribution of sea ice which in turn depends on ocean current and on the Arctic and North Atlantic Oscillations. The large variability in ice thickness of Arctic glaciers and ice caps as well as different ice temperatures is expected to result in different responses to climatic changes. In addition,



Fig. 6.11.1 Waldemarbreen

Fig. 6.11.1 Waldemarbreen in the western part of Svalbard (summer of 2006). Source: I. Sobota, Nicolaus Copernicus University, Poland.

some of the rapid glacier advances might have been related to volcanic activities (in Iceland), glacier surges or calving processes rather than to climatic events.

The timing of the LIA maximum extent of glaciers and ice caps differs between the regions. It is estimated to the mid 18th century for Iceland and the end of the 19th century for the Canadian Arctic Archipelago (Grove 2004). The few investigations from Greenland indicate that many glaciers and ice caps (e.g. on Disko Island) reached their maximum extents before the 19th century (Weidick 1968). In the LIA the glaciers on Svalbard were close to their late Holocene maximum extent and remained there until the onset of the 20th century (Svendsen and Mangerud 1997).

Iceland and the western part of Svalbard are quite well represented in glacier observation series. Front variation series span most of the 20th century. Continuous mass balance measurements are available since the end of the 1960s from Svalbard (Austre Brøggerbreen, Midtre Lovénbreen) and since 1988 from Iceland (Hofsjökull North). Available fluctuation series from glaciers and ice caps of Greenland and the Canadian Arctic Archipelago are sparse and most of them were interrupted in the 20th century. The only long-term mass balance series, starting in the early 1960s, are available from White and Baby Glacier (Axel Heiberg Island), as well as from the

Fig. 6.11.2 The Hofsjökull Ice Cap, Iceland. Source: ASTER satellite image (50 x 51 km), 13 August 2003.

Fig. 6.11.3 Glaciers draining the Grinnell Land Icefield on Ellesmere Island, Canadian Arctic. Source: ASTER satellite image (62 x 61 km) and close-up, 31 July 2000.

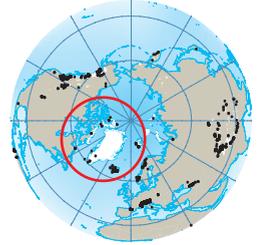
**Ice covered area (km<sup>2</sup>):** 275 500

**Front variation**

number of series: 93  
 average number of observations: 31  
 average time length (years): 52

**Mass balance**

number of series: 34  
 average number of observations: 13



Devon Ice Cap (Koerner 2005). Archaeological findings, historical documents, trim lines together with the fragmentary measurement series, give evidence of a general retreating trend of the Arctic glaciers and ice caps since the time when of their LIA extent which slowed down somewhat during the middle of the 20th century (Dowdeswell et al. 1997, Grove 2004, ACIA 2005). Glaciers on Cumberland Peninsula, Baffin Island, yield an area loss of 10–20 per cent between the LIA maximum extent and 2000 (Paul and Käab 2005). However, there are several regional or glacier specific variations found in this overall trend such as the mass gain of Kongsvegen (Svalbard) in the early 1990s (Hagen et al. 2003) and periods of glacier retreat (1930–1960,



after 1990) and advance (1970–1985) in Iceland (Sigurdsson et al. 2007).

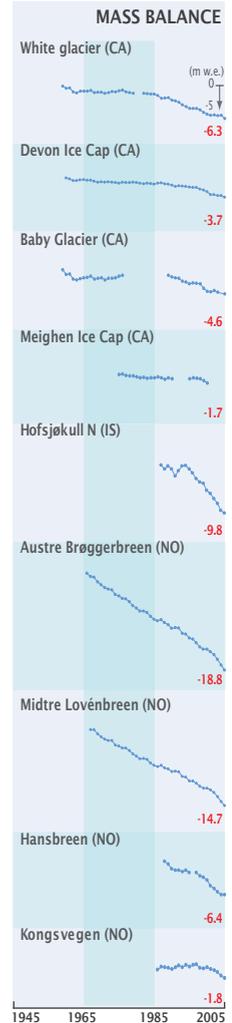


Fig. 6.11.3 Grinnell Land Icefield

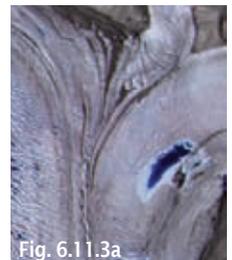


Fig. 6.11.3a