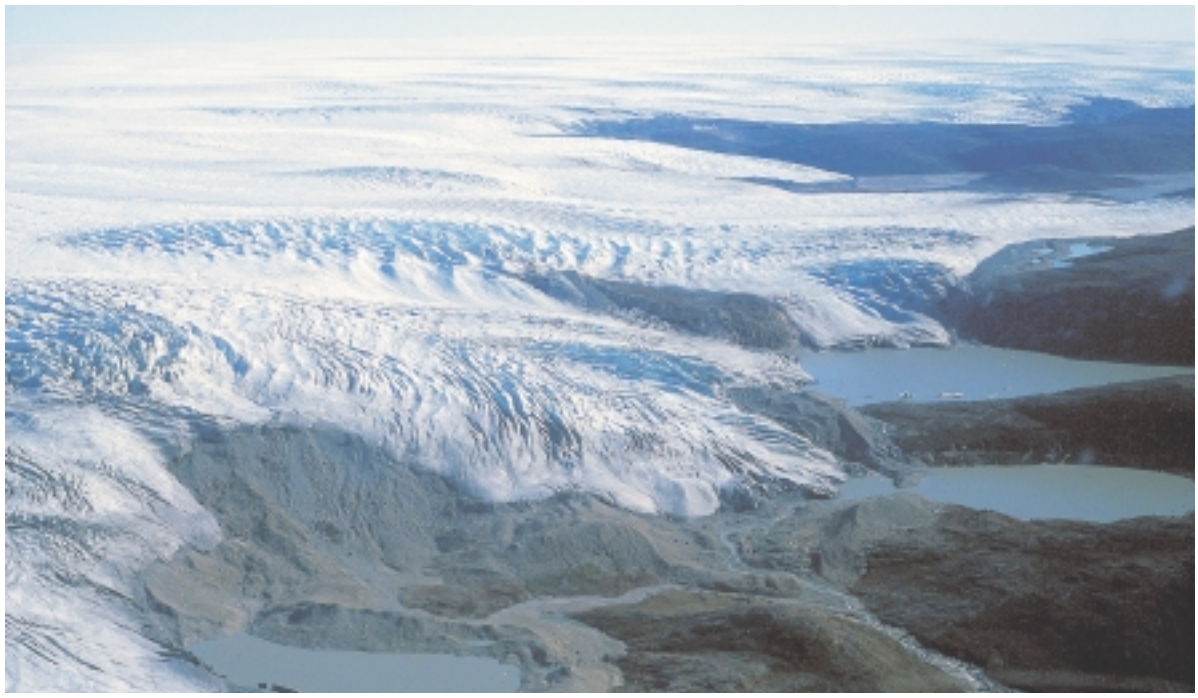

Fig. 44. Characteristic front of the Inland Ice abutting the ice-free land area, with moraines and small lakes. The distance from the bottom of the picture to the land area in the background is approximately 5 km. The locality is about 75 km north-north-east of Søndre Strømfjord airport, southern West Greenland, at c. 67°30′N. View is towards south. Photo: H. Højmark Thomsen.

areas at present shows only minor fluctuations (Fig. 44). Significant movements are almost restricted to major drainage outlets where the Inland Ice flows into fjords to form calving glaciers; the most active glaciers in Greenland have velocities of up to 22 m in 24 hours.

Glaciology

The present ice cover of Greenland is a relic of the Pleistocene ice ages. It consists of the large continental ice sheet (the Inland Ice), and local ice caps and glaciers (Weidick 1995). The Inland Ice has an area of *c*. 1 707 000 km^2 and reaches an altitude of 3230 m with a maximum thickness of 3420 m. The local ice caps and glaciers cover areas of *c*. 49 000 km^2 (Weng 1995). The volume of the Inland Ice has been estimated at 2 600 000 km^3, based on ice thickness measurements by airborne radio-echo sounding; a rough estimate of the volume of local ice caps and glaciers is 20 000 km^3. On the map, surface contours, isopachs of ice thickness and contours of the bedrock below the Inland Ice, are shown.

Mean annual air temperatures on the Inland Ice range from –30°C over a large region in the central and northern parts to about –5°C in south-western marginal areas. The temperature of the ice ranges between –32° and 0°C; with increasing depth, temperatures generally increase due to geothermal heat flux and internal heating caused by ice deformation. In some locations, the temperature at the base of the ice sheet may reach melting point.

Mass balance

The mass balance (budget) of the Inland Ice is the difference between accumulation (mainly snow in the interior region) and ablation by melting and by calving of icebergs in the marginal areas.

Snow accumulation decreases from south to north from more than 2000 mm water equivalent/year in coastal areas in the south-west to 100 mm water equivalent/year or less in interior north-eastern areas (Ohmura & Reeh 1991). Melt rates also decrease from south to north. Away from the coast in South-West Greenland, annual melting of the ice at sea level probably reaches values near 10 000 mm water equivalent. However, even along the northernmost margins of the Inland Ice significant melting occurs; melt-rate models predict values near 2000 mm water equivalent/year at sea level. Calving glacier fronts producing icebergs are generally located at the heads of fjords at some distance from the outer coast. The most concentrated source region for icebergs is central West Greenland (Disko Bugt and the area between Nuussuaq and Svartenhuk Halvø) where about 100 km^3 of calf ice are produced annually.

Past climate and environment

Up to 1998 five deep ice cores had been retrieved by drilling through the Inland Ice (one drilling only to a depth of 1400 m), and these have provided considerable information about climate and environmental variations during the past 150 000 years. The ice-core records indicate that in central Greenland the Inland Ice survived the last interglacial (the Eemian), which culminated about 130 000 years ago, without disappearing when the climate was several degrees warmer than at present. However, during the Eemian the ice cover in northern and southern Greenland was less extensive, according to ice-dynamic model calculations of the evolution of the Inland Ice (Fig. 45).

The ice-core records indicate dramatic temperature fluctuations during the last ice age, which lasted from about 100 000 years ago to about 10 000 years ago. In the coldest parts of this period, temperatures in Greenland may have been 10–12°C colder than now, whereas temperatures in other periods of the ice age were only about 5 degrees colder (Dansgaard 1997; Hammer 1997).

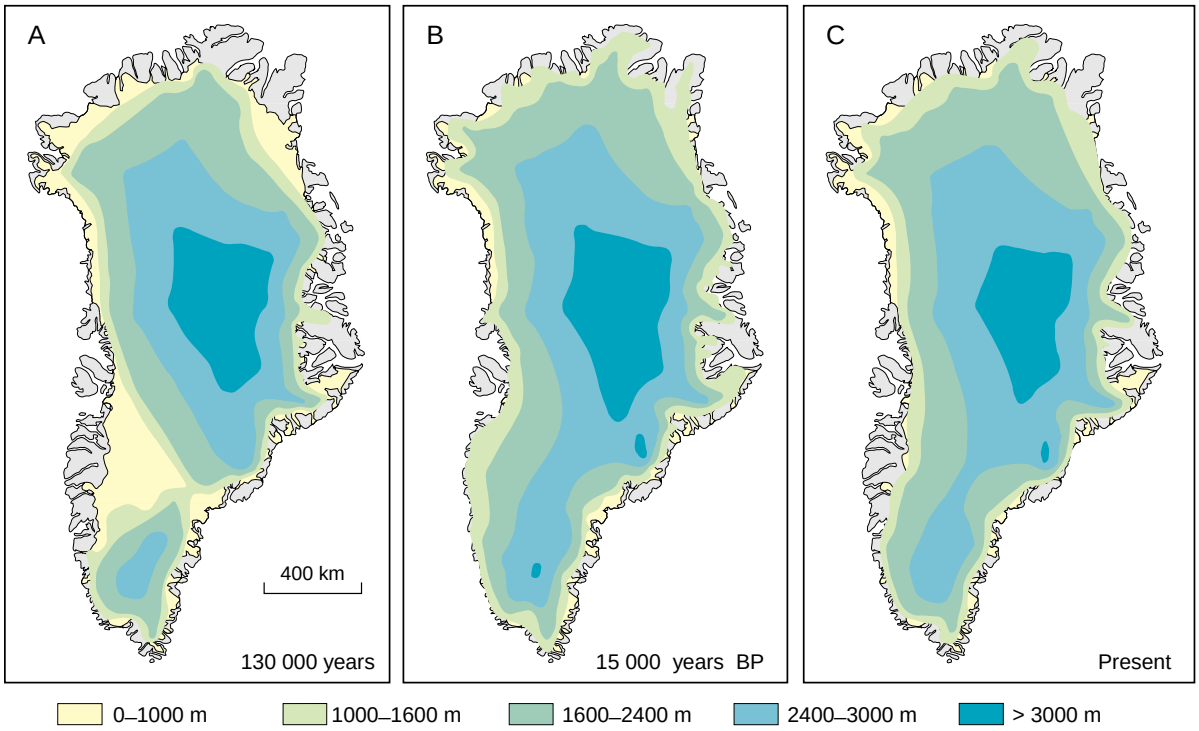

Fig. 45. Model of the Inland Ice with indication of thickness of the ice sheet in metres. **A**: The last interglacial (the Eemian) with a temperature 4–5°C higher than the present. **B**: During the late glacial maximum (Weichselian) with a temperature 10–12°C colder than present. **C**: Under the present climatic conditions. From model calculations by Letréguilly *et al.* (1991). The models do not include the offshore extent of the ice, only that of present land areas. **Colours** depict the thickness of the ice sheet.