

DEVON ICE CAP RESEARCH 2001-2008: WHAT HAVE WE LEARNED?

- The ice cap's area is 14,010 km², its volume is 3980 km³, and its greatest thickness is 880m. If it all melted it would raise global sea level by 10mm.
- 4% of the ice cap's margin is in contact with the ocean and produces icebergs
- The ice cap area decreased by 332 km² (2.4%) between 1960 and 2000.
- The biggest glacier retreats involved the stagnant southwest arm of the ice cap, and the large outlet glaciers that end in the ocean, which retreated by up to 1.3 km.
- The northwest margin of the ice cap advanced slightly between 1960 and 2000 and may still be responding to climate cooling during the Little Ice Age.
- The rate of snow accumulation on the ice cap decreased significantly after 1989, compared with the 1963-89 period. This seems to be due to increased sea ice cover in the North Open Water Polynya in late summer and early fall, and to less frequent passage of air masses over this region en route to the ice cap.
- The ice cap lost mass at a higher rate after 1987 because of a change in atmospheric circulation that allowed more frequent intrusion of warm air masses into the Arctic Islands from continental North America in summer.
- The total mass loss due to surface melting and runoff between 1963 and 2000 was about 59 km³.
- The annual precipitation averaged over the ice cap (1980-2006) was around 200mm per year; on average, melting produced around 720 mm of water each year, about 90 mm of which percolated into the snow pack and refroze. The rest was lost as runoff.
- In the period 2000-2004, melt occurred for about 42 days a year on average. The extremes were 35 days in 2004 and 52 days in 2001.
- The eastern part of the ice cap is drained by a large number of fast flowing (up to 300m yr⁻¹) outlet glaciers that end in the ocean, while the western part is drained by slow flowing (< 30 m yr⁻¹) ice lobes that end on land.
- Between 1960 and 1999 about 21 km³ of ice was lost from the ice cap by calving of icebergs. About half of this was lost from the Belcher Glacier alone. Thus, 25-30% of the mass loss from the ice cap occurs by calving.
- Thinning is occurring at all elevations in the south-eastern part of the ice cap, and at lower elevations in all major drainage basins. It appears that recent changes in rates of glacier flow are influencing rates outlet glacier thickness change.
- Thickening is occurring above 1200m elevation in 2 basins in the NW of the ice cap and may be due to stiffening of the ice in this region due to the recent arrival of the Little Ice Age cooling wave at the ice cap bed.
- There are large year-to-year variations in the depth and density of the snowpack on the ice cap at the end of the melt season. These are related to temperature driven changes in the rate of snow densification and may complicate the interpretation of ice elevation changes measured by airborne or spaceborne altimeters in terms of changes in ice cap mass.