

Permafrost, Glaciers and Sea Ice

Abstract

Nunavut's cold climate makes it a territory consisting of mostly barren land and permafrost. Permafrost is soil or rocks whose temperature remains at or below the freezing point for a long period of time. Glaciers, a mass of snow and ice that does not melt from year to year prevail in the Innuitian Mountains. Permanent sea ice occurs in the northern part of the Arctic Ocean.

Permafrost

The landscape of Nunavut is marked by permafrost which occurs continuously or discontinuously throughout the territory. Permafrost is soil or rocks whose temperature remains at or below the freezing point for a long period of time. This can mean a period lasting from one winter to the next, however most permafrost has existed for much longer.

Permafrost is composed of many strata. Between the permafrost and the surface is an active layer which thaws in summer and freezes in winter. Because ice loses volume when it melts, and as the soil underneath is impermeable, this active layer is unstable and tends to collapse. This condition adds to the difficulty of building roads, airfields, public utilities and other infrastructure. Indeed, there are only about thirty kilometres of highway in the entire Territory of Nunavut. Permafrost does not inhibit vegetation, plants still grow above the permafrost throughout much of the region.

Glaciers

The same map illustrates the location of glaciers. A glacier is a perennial mass of snow and ice, formed mainly by the compaction and recrystallization of snow, that does not melt from year to year. Today the extent of areas covered by glaciers in Canada is minimal. They are found most extensively in or near the mountains along the north-eastern edge of Nunavut.

Sea Ice

Sea ice is defined as any ice that has formed from the freezing of seawater. This layer illustrates the area of the Arctic Ocean that is frozen year round - the minimum ice limit. The northernmost edge of Ellesmere Island extends into this ice sheet. During the fall and winter months the ice sheet often extends much further south, as

far as Hudson Bay, leaving almost the entire territory of Nunavut surrounded by sea ice. An animation created with data provided by Environment Canada's Ice Service. The animation illustrates the extent of seasonal sea ice in the various months of the year.

Animation of the Seasonal Change of Sea Ice

The animation, seasonal_change_sea_ice(1).gif is located in the animated gif folder.



Formation of sea ice begins in mid-September in the Canadian Arctic and advances southward through the onset of winter. Sea ice begins to form in the St. Lawrence estuary around January 1st and advances from coastal inlets into the Gulf of St. Lawrence. Sea ice in Canada normally reaches a maximum extent at the beginning of March. At that time, sea ice is usually present in coastal waters of Canada except for those of British Columbia where warm ocean currents from the south prevent the formation of sea ice.

Decay or melt of sea ice begins in the spring in the Gulf of St. Lawrence and over East Newfoundland waters and retreats northward towards the Labrador coast. In June openings appear in the northern portion of Baffin Bay and along the Western coast of Greenland which progress eastward and southward during June and July. During that time the Beaufort Sea begins to show signs of break-up while clearing is underway in Hudson Bay. Break-up continues throughout the summer months, reaching a minimum extent around mid-September, after which freeze-up begins through the remainder of September.

Source: Environment Canada. Canadian Ice Service. Regional Charts for the period 1969 to 1998

Map Sources

Permafrost

Natural Resources Canada. 1993. Canada-Permafrost [map]. Fifth Edition, National Atlas of Canada.

References

Harris, S.A. et al. 1988. Glossary of permafrost and related ground-ice terms. Permafrost Subcommittee, Associate Committee on Geotechnical Research, National Research Council of Canada. Ottawa : National Research Council Canada.

Nunavut Implementation Commission. 1995. Footprints in New Snow: A comprehensive Report from the Nunavut Implementation Commission to the Department of Indian and Northern Development, Government of the Northwest Territories and Nunavut Tunngavik Incorporated Concerning the Establishment of the Nunavut Government. Iqaluit, Northwest Territories. 263 pp.

Related Web sites (1999 – 2009)

Federal Government

CEONet Database.

<http://ceonet.ccrs.nrcan.gc.ca/>

Find maps, satellite images, publications and other geospatial data provided by Canadian and international organizations.

Natural Resources Canada. Geological Survey of Canada. Permafrost

http://gsc.nrcan.gc.ca/permafrost/publications_e.php

Permafrost Publications at the Geological Survey of Canada.

Natural Resources Canada. Geological Survey of Canada. Permafrost

http://gsc.nrcan.gc.ca/permafrost/index_e.php

Permafrost research at the Geological Survey of Canada

Other

State of the Canadian Cryosphere (permafrost, frozen ground) University of
Waterloo, Ontario
<http://www.socc.uwaterloo.ca/>

