2.4 Climate and Coastal Landscape Instability: Socio-Economic and Ecological Impacts

Summary

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The Arctic coastline is a highly dynamic environment where many landscape processes take place. Erosion, sedimentation, coastal progradation and retreat lead to sediment and carbon transfers as dissolved and particulate carbon are released into the near-shore zone. These processes are regulated by climate-controlled factors such as duration of the ice season, the dynamics of shore-fast ice, waves, tides and surges. Erosion of coastal permafrost is a fast process with many consequences for both the ecology of the landscapes and the coastal communities. The Inuit having traditionally harvested the major part of their living resources from the sea and from the coastal regions, they are a coastal people. In addition to new knowledge of the dynamics of the coastal landscape for preserving the quantity and the quality of their traditional food resources, the need to better understand permafrost dynamics in coastal regions stems from the recent modernisation that has created new requirements in public services for construction, housing and transportation, leading to development of civil engineering structures such as roads, airports, port and harbour facilities, water supply, and waste disposal facilities. The objectives of this project are: (1) to quantify the potential impact of climate change on northern landscapes and shorelines around communities and in areas of traditional land use, including evaluation of thaw subsidence, mass wasting and coastal retreat. This will include detailed study of surficial geology, permafrost and ground ice conditions around communities and seasonal camp areas and will compliment studies on coastal sensitivity (Project 1.5), water quality (Project 2.2) and carbon and contaminant cycling (Project 3.4). (2) To compare anticipated climate and landscape change with the Holocene paleoclimatic record, particularly from lakes that had their sedimentological regime affected by permafrost thawing in their catchment, and from oral histories. Recent climate variation and landscape changes will be identified through time-lapse mapping of selected sites affected by thermokarst and through cryostratigraphic investigations of changes at the active layer/permafrost boundary. This project will also be undertaken in concert with Project 2.2. (3) To evaluate the impact of landscape change on the activities of northern people, northern communities and northern resource development. (4) Through teaching, science camps, public lectures and student supervision promote a better understanding of the impact of climate change on northern peoples.

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Ministère des affaires municipales et des régions du Québec
IPY Federal Program Office
Nunavut Research Institute
A.D. Latournell Endowment Fund
Tranports Canada
Canadian Space Agency
Indian and Northern Affairs Canada - Northern Science and Contaminants Research Directorate
Natural Resources Canada - Geological Survey of Canada
Global Environmental and Climate Change Centre (GEC3)
Transport Québec
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Natural Resources Canada - Polar Continental Shelf Project
Queen's University
NASA - National Aeronautics and Space Administration

Publications

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Grom, J.D. and Pollard, W., 2007, Retrogressive Thaw Slump Process and Morphology, International Summer School on High Latitude Climate Change, September 2007, St. Petersburg, Russia, 1, Published


Lamoureux, S. and Lafrenière, M., 2007, Hydrological impact of extensive permafrost disturbance in a High Arctic Watershed, Cape Bounty, Melville Island, Plenary presentation at the ArcticNet Annual Science Meeting, Blue Mountain, 1, Published


Grom, J., Gascon, G. and Veillette, J., 2007, A Review of the ArcticNet Training Fund and the Opportunity to Attend the International Summer School on High Northern Latitude Climate in St. Petersburg, Russia, 2007 ArcticNet Annual Conference Proceedings, 11, Published

Lévesque, A.-M., 2007, Salluit: Analysis of Significant Climatic Events Relevant to Public Safety and Town Planning and Assessment of their Future Frequency and Intensity, 2007 ArcticNet Annual Conference Proceedings, 11, Published


Lajoie, M., St-Onge, G., Lajeunesse, P., 2007, Holocene Chronostratigraphy and Sedimentology of Eastern Hudson Bay and Western Hudson Strait, 2007 ArcticNet Annual Conference Proceedings, 68, Published


Stewart, K.A. and Lamoureux, S.F., 2008, Seasonal hydroclimatic variability and limnology in two adjacent high arctic watersehds: Cape Bounty, Melville Island, Nunavut, Arctic Workshop, Boulder, Colorado, 1, Published

Chutko, K.J. and Lamoureux, S.F., 2008, Stratigraphic analysis of a complex biolaminated sedimentary sequence from a coastal High Arctic lake, Arctic Workshop, Boulder, Colorado, 1, Published

Chutko, K.J. and Lamoureux, S.F., 2008, A post-emergence record of laminated organo-clastic sediments in a coastal freshwater High Arctic lake, Northeast GSA meeting, Buffalo, 1, Published

Specialized Publications


Lavoie, C., 2006, Géomorphologie et Quaternaire du Lac Guillaume-Delisle (Nunavik), Canada, PhD Thesis, Dépt. de Géographie, Université Laval, 1, Accepted

Heyes, S., 2007, Inuit knowledge and perceptions of the land-water interface, Ph.D. thesis, 1, Published

