Co-chairs: **Volker Rachold** Alfred Wegener Institute, **Steven M. Solomon** Natural Resources Canada

The abstracts from the talks and posters presented during the Coastal Processes session can be found on pages 153–171.

The coastal zone is the interface through which land-ocean exchanges in the Arctic are mediated, and it is the site of most of the human activity that occurs at high latitudes. The arctic coastlines are highly variable, and their dynamics are a function of environmental forcing (wind, waves, sea-level changes, sea ice, etc.), geology, permafrost and its ground-ice content, and morphodynamic behavior of the coast. Environmental forcing initiates processes such as degradation of coastal permafrost and sediment transport by waves, currents, and sea ice (Figure 1). The coastal response (erosion or accretion) to these processes results in land and habitat loss or gain and thus affects biological and human systems.

Coastal processes in the Arctic are strongly controlled by regional phenomena, such as the sea-ice cover and the existence of onshore and offshore permafrost. During the prolonged winter season, the thick and extensive sea-ice cover protects the coastline from hydrodynamic forcing. During the open water season, sea ice is an important transport agent for coastal sediments. The coastal zone also marks the transition between onshore and offshore permafrost. During the short ice-free period, the unlithified ice-rich, permafrost-dominated coastlines can be rapidly eroded (at rates of up to several meters per year); the resulting coastal sediment, organic carbon, and nutrient fluxes play an important role in the material budget of the Arctic Ocean. Degradation of permafrost also releases trapped greenhouse gases (GHG).

Global and regional climate changes will significantly affect physical processes, biodiversity, and socio-economic development in arctic coastal areas. Additionally, arctic coastal changes are likely to play a role in global systems via feedbacks through the material flux generated by eroding coasts and the GHG emission from degrading coastal permafrost (Figure 2). Thus, the overall scientific goals of arctic coastal research are to:

- identify and understand the key processes controlling arctic coastal dynamics and their impacts on human systems, biology, and ecosystems;
- decipher and quantitatively assess the role of arctic coasts in the global system, including estimates of coastal retreat, material flux, and GHG emission from permafrost degradation; and
- establish models to predict the future behavior of the arctic coastal region in response to climate and sea-level changes.

The presentations of the coastal session at the SEARCH meeting have been grouped into three broad topics:

- overviews of international programs and initiatives,
- physical processes controlling arctic coastal dynamics, and
- impact and feedback of coastal material fluxes on arctic biogeochemical cycles.

Programs and Overviews
Significant efforts are underway to expand our understanding of arctic coastal processes. Arctic Coastal Dynamics (ACD) is a multi-disciplinary, multi-national project of the International Arctic Science Committee (IASC) and the International Permafrost Association (IPA); observations of coastal morphology, geology, and stability are the focus of ACD activities. Land-Shelf Interactions (LSI) is a new program under the Russian-American Initiative on Shelf-Land Environments in the Arctic (RAISE). Plans are underway to examine both biological and physical aspects of the arctic nearshore zone as part of the International Polar Year 2007–2008.

Physical Processes
These talks highlighted the coastal aspects of the arctic climate-cryospheric systems. Sea ice plays both destructive and constructive roles in the nearshore zone. Coastal processes occurring at high latitudes differ fundamentally from those at temperate latitudes because of the presence of ice (both ground ice and sea ice) and permafrost. Arctic coastal environments are poorly represented in observing systems. Improved observing networks and advances in understanding of coastal processes are critical steps towards developing predictive models of coastal response to changing climate.

Biogeochemical Processes
These papers engendered lively discussions about carbon input to the arctic seas and its ultimate fate. This highlights the uncertainty about the role of coasts in contributing to global carbon budgets, especially in the Arctic.

Conclusion
In summary, the session was a good starting point for focusing interest on coastal activities and issues. There remains a difficulty in developing better linkages between coastal researchers and those undertaking larger scale studies from a North Pole-centric perspective.

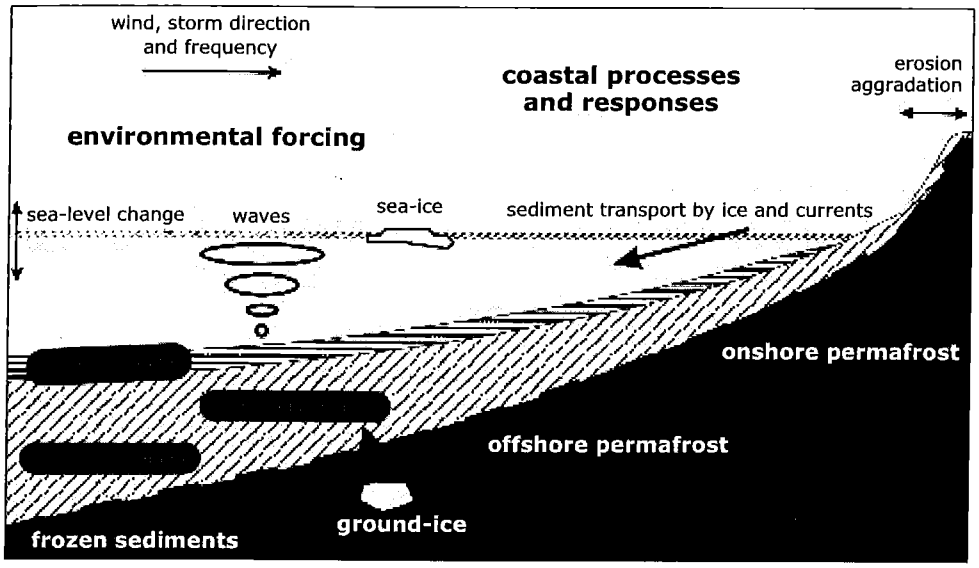

Figure 1. Arctic coastal processes and responses to environmental forcing.

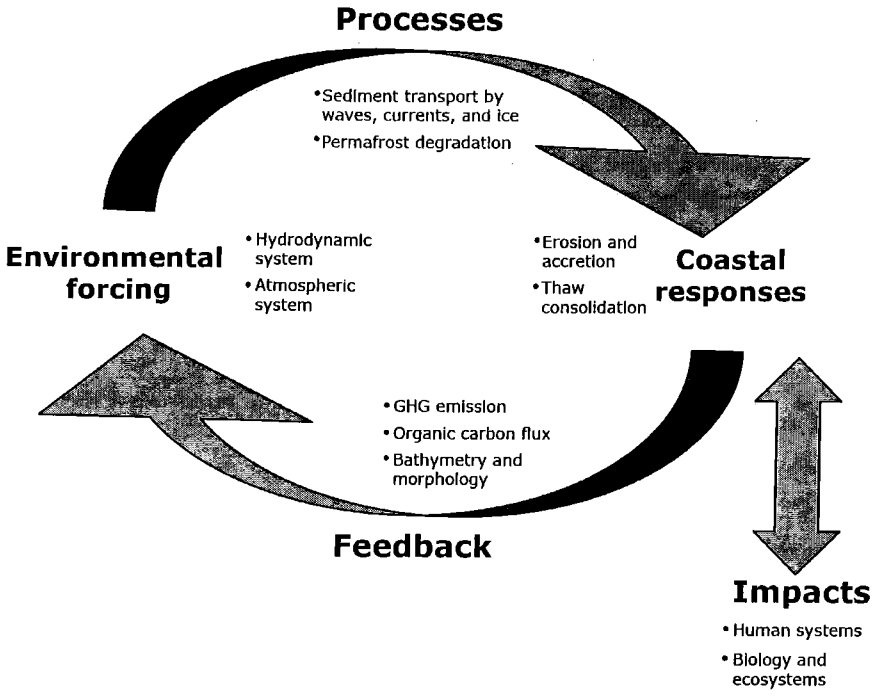

Figure 2. Environmental forcing, coastal processes and responses, impacts, and feedback.