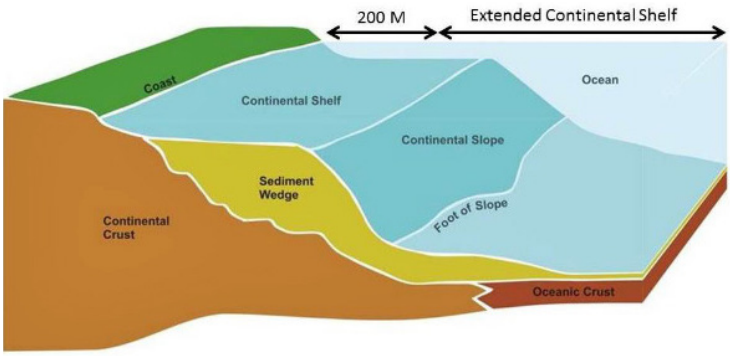
Canada's Extended Continental Shelf Program

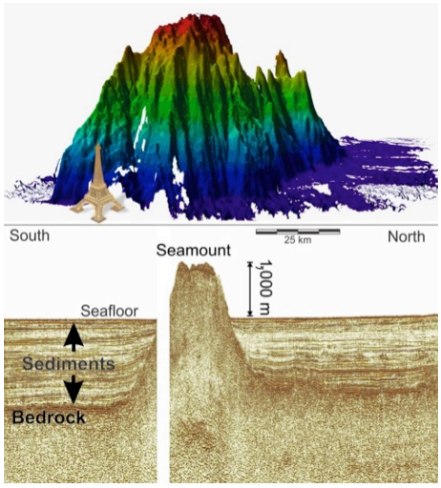
Canada is a coastal state with a large continental shelf extending beyond 200 nautical miles (M) from shore in the Atlantic and Arctic oceans. In 2003, Canada embarked on a history-making project to define the outer limits of this continental shelf. Scientists are studying the Canadian continental shelf as part of the Extended Continental Shelf (ECS) Program, an initiative to identify characteristics of the shelf under the Atlantic and Arctic oceans. This research is part of Canada's submission to the United Nations Commission on the Limits of the Continental Shelf (CLCS) and will help define Canada's future outer jurisdictional limits.

UNCLOS

The United Nations Convention on the Law of the Sea (UNCLOS) is an international agreement that recognizes that coastal states have sovereign rights over the natural resources of the seabed and subsoil beyond 200 M, as well as jurisdiction over certain activities such as marine scientific research. The convention sets out a process for coastal states to define with precision the outer limits of their continental shelves and obtain international recognition for those limits. Canada became a party to the convention in December 2003. Ten years later, Canada filed a submission regarding its continental shelf in the Atlantic Ocean that includes 1.2 million square kilometres (km^2) of area outside of its 200 M Exclusive Economic Zone. In the Arctic Ocean, scientists conducted surveys almost annually since 2006.



The continental shelf is the natural extension of the continent as it descends to the ocean floor. The extended continental shelf is the area beyond the 200 M zone.



Top: 3D image generated by multibeam bathymetric data of a seamount discovered in the Arctic Ocean during surveying. The Eiffel tower is shown for scale.

Bottom: Seismic profile over the seamount, showing that most of it is buried by sediments, but more than 1,000 metres (m) of it stands above the adjacent seafloor.

Science of surveying

To determine the limits of Canada's continental shelf, researchers must demonstrate scientifically that the extended continental shelf is a part of Canada's land territory. As of 2016, Canada had completed 21 surveys in the Atlantic and Arctic oceans to map the seabed's topography (shape) and the thickness of deposits (sediment thickness).

Seismic surveys map the seafloor and measure the thickness of sediment beneath the seafloor by using sound waves that travel through the water and sediment column. Geologists use echo returns to determine which waves represent sediments and which represent bedrock. With this data, a geologist can interpret geologic processes and measure the sediment thickness.

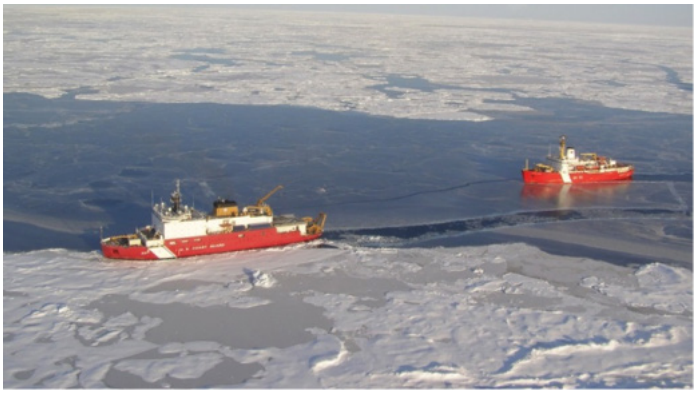
Canada

Bathymetric surveys use sonar to measure the depth of the ocean and to create detailed images of the topography of the seafloor. Multibeam bathymetry uses hundreds of beams that sweep the seafloor (in a swath-shaped array), providing enough data to allow digital terrain modeling (3D images) of the seafloor.

Survey logistics

Ice camp surveys were used to collect seismic and bathymetric data in the Arctic Ocean. Autonomous underwater vehicles (unmanned mini-submersibles) were also used in 2010 to collect bathymetric data under the ice. The field season for these surveys is short, about six weeks in the spring. Ice camps must be built from scratch, including constructing an airstrip, and all supplies flown in. They must be completely disassembled and all equipment removed at the end of the survey. These surveys also use helicopters, and the temperature needs to be cold enough so that no ice fog forms, which prevents the helicopters from flying and could strand researchers on ice floes.

Ship surveys are being used to collect bathymetric and seismic data over thousands of kilometres. The field season for ship surveys in the Arctic Ocean is limited to August and September, when the ice is thinnest. Even in this window, ice conditions can present challenges. For operational and scientific reasons, Canada has worked with other Arctic coastal states to collect and interpret data. Four joint surveys with the United States were done using an icebreaker from each country – the CCGS *Louis S. St-Laurent* and the USCGC *Healy*. Working together ensured a higher quality of data and access to areas that may not have been accessible by a single ship. It also increased safety by ensuring that neither ship would become stuck in the ice and unable to free itself.



The USCGC *Healy* breaks the ice and clears a path ahead of the CCGS *Louis S. St-Laurent* as it collects multibeam bathymetric data.

The research team from the 2007 joint Canada-Denmark seismic project in Alert, Nunavut.

Survey team

Scientists with Natural Resources Canada's Geological Survey of Canada (GSC) and surveyors with Fisheries and Oceans Canada's Canadian Hydrographic Service (CHS) collect and interpret the scientific data for Canada's UNCLOS submission. The GSC and CHS also prepare the submission from a scientific/technical standpoint and support engagement with the CLCS.

Global Affairs Canada is responsible for the legal aspects of the submission, the associated diplomatic work and engagement with the CLCS.

Other departments and agencies involved include the Canadian Coast Guard, Environment Canada, National Defence and Parks Canada.

International collaboration includes joint surveys with Denmark and the United States, as well as cooperation with Russia.

For more information, visit:
science.gc.ca

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