When thinking of earthquake-prone areas, places such as California usually come to mind. Recently, however, Ontario and other parts of Canada have witnessed moderate earthquake activity that has heightened public concerns about safety. In 2001, Canadian researchers established POLARIS—Portable Observatories for Lithospheric Analysis and Research Investigating Seismicity—a major initiative launched to predict earthquake ground motion and investigate the structure and dynamics of the Earth’s interior.

What is POLARIS?
POLARIS is a research consortium of portable, broadband, geophysical observatories installed across Ontario, British Columbia, the Northwest Territories, Quebec, Nunavut and Nova Scotia. It consists of five satellite-telemetry arrays, each with several seismograph systems and magnetoelluric (MT) field instruments. These observatories are connected to a satellite that transmits live data through the Internet, enabling its users to monitor earthquakes continuously. The project involves scientists from several research institutions and from The Geological Survey of Canada who want to know more about earthquake occurrence rates, severity and spatial distribution.

Seismic Activity in Ontario
Because Southern Ontario is home to millions of people and critical infrastructure such as nuclear power plants, the risks of earthquakes in this region are a significant concern. In the past few years, seismologists have observed a flurry of seismic activity near Madoc, Ontario, and have recorded a magnitude 5.2 earthquake at Temiskaming, Quebec. In 1991, the Southern Ontario Seismic Network (SOSN) was established to help scientists obtain information on seismic activity in a part of Southern Ontario that has several nuclear power plants and has had a number of small earthquakes. In 2001, SOSN stations were incorporated into the POLARIS network.

Ontario’s POLARIS array, known as POLO, includes more than 40 seismographs, along with MT devices, from Ottawa to Windsor and from Niagara to Georgian Bay. With this high density of recording equipment, POLO allows researchers to study critical earthquake parameters such as depth distribution and gives them more information about southern Ontario’s Precambrian basement architecture—necessary for a more complete picture of the area’s earthquake hazards.

Research
POLARIS provides researchers with key information on how seismic waves are generated and propagated, and how these waves damage structures. Ontario’s POLARIS array facilitates the three-dimensional mapping of the province’s lithospheric architecture and helps identify potential zones of crustal strain, deformation and weakness. Along with helping researchers determine seismic risk and develop rapid earthquake warning technology, POLO brings together more than 30 scientists for collaboration and exploration.

The Western Connection
Data from the POLARIS network are transmitted via VSAT satellite to a hub at The University of Western Ontario that is accessible to researchers across Canada. SOSN is also operated by the Department of Earth Sciences at Western on behalf of Ontario Power Generation. The $6-million Ontario Research Centres in Earthquake Hazards and Continental Dynamics initiative operates under the auspices of POLARIS and is led by Western, along with scientists and engineers from Queen’s and Carleton.

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For more information, please visit: http://polaris.es.uwo.ca/