

First Call for Proposals to borrow POLARIS VSAT broadband seismograph stations



1. Introduction

POLARIS is a Canadian university-government-industry geophysical consortium focused on investigation of the structure and dynamics of the Earth's lithosphere and earthquake ground motion. Funding for POLARIS has been obtained from the Canada Foundation for Innovation (CFI), the Ontario Innovation Trust (OIT), the British Columbia Knowledge Development Fund (BCKDF), Natural Resources Canada (NRCan) and from a variety of other sources including the private sector. Partial operational support for POLARIS has been provided by NSERC through its Major Facilities Access program.

The POLARIS steering committee envisions that over the next three years most of the 90 POLARIS broadband satellite-telemetered seismograph stations that are currently deployed will become available for other scientific investigations. These systems are unusually flexible, in that they provide real-time data access without the need for an Internet connection, have complete autonomous solar power systems and have proven reliability under temperate and subarctic conditions.

Researchers from CFI-eligible institutions are invited to submit applications to borrow POLARIS equipment, under the general terms set forth below. Other researchers, including researchers from outside Canada, are also invited to apply in collaboration with (a) co-investigator(s) from a CFI-eligible institution.

2. Description of the Portable Observatories for Lithosphere Analysis and Research Investigating Seismicity (POLARIS)

POLARIS is a Canadian university-government-industry geophysical consortium focused on investigation of the structure and dynamics of the Earth's lithosphere and the prediction of earthquake ground motion. The original POLARIS concept is based on combined seismological and magnetotelluric (MT) studies of the Earth using remote observatories transmitting data over a VSAT satellite network and using Libra seismograph systems manufactured by Nanometrics Inc. of Ottawa, Ontario. An extension of this concept is currently being developed to upgrade some of the observatories with geodetic sensors measuring crustal deformation using the Global Positioning System (GPS).

Currently, 90 broadband seismographs are installed in three arrays in Ontario (ON), British Columbia (BC) and the Northwest Territories (NWT). These systems transmit continuously by satellite (VSAT) telemetry to central data acquisition hubs in London and Ottawa. These hubs both receive data and can control remotely the functions of each station. The POLARIS live data are ported over the Internet to the facilities of the Earthquakes Canada Program of the Geological Survey of Canada (GSC) in Ottawa, to be processed and archived along with the GSC's own data. All POLARIS data are rapidly made available to Canadian and foreign researchers via an AutoDRM, a web-based standard international data request form, as well as by download in standard data formats from the POLARIS website (www.polarisnet.ca).

The POLARIS infrastructure is unique in design, operation and data quality control. Most POLARIS observatories are powered by photovoltaic energy and demonstrate the utility of the VSAT equipment in harsh Canadian environments. Seasonally-inaccessible northern stations can be remotely interrogated and problems diagnosed, perhaps even corrected. For example, seismometer tilting can be compensated for electronically. The telemetry also allows rapid posting on the POLARIS website of, for example, seismograms from all globally-significant earthquakes of magnitude 5 or greater or all local and regional Canadian events only minutes after occurrence.

A typical POLARIS observatory (pictured below) is powered by 6 to 12 solar panels. The seismometer vault is normally a few tens of meters from the VSAT antenna. Storage batteries, with a capacity of about 15 days, are housed in a sealed battery box. A 12-channel GPS link provides precise timing for VSAT and seismic data. Provisions are made to add other, such as MT and geodetic, sensors to the system. Data from POLARIS observatories are available on the Internet within 5 seconds of recording.

The POLARIS infrastructure is designed in a scalable and modular form. Additional remote geophysical observatories can be installed and accommodated within the current communications infrastructure. POLARIS hubs can readily expand to increase data type and volume. Other sensors, meteorological for example, can be added to POLARIS observatories and their data piped to the Internet for the user community.

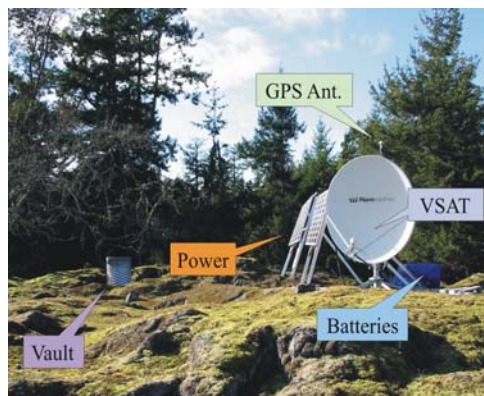
Typical POLARIS data flow starts at one of the two hubs at UWO (London Ontario) and at the Geological Survey of Canada (Ottawa), respectively. Data are stored locally at the hub, and can be accessed from the polaris website. Final archive copies are made at the GSC's Earthquakes Canada Program via www.earthquakescanada.ca.

The POLARIS infrastructure is managed by a steering committee composed of Canadian scientists and engineers who are actively involved in POLARIS research. Contact information for the steering committee can be found at the POLARIS website (www.polarisnet.ca).

3. Re-deployment of POLARIS VSAT broadband seismograph stations

At the discretion of the steering committee, some of the POLARIS portable geophysical observatories will become available for re-deployment commencing 1 October 2005. The purpose of re-deploying the equipment will be to support world-class geophysical research studies, beyond the scope of the initial infrastructure deployment. Please consult <http://www.polarisnet.ca/outreach/agu-00-poster/polposter.html> for background on the original scope of the POLARIS program. Proposals to extend the deployment period at existing seismograph locations will also be considered and will be subject to the same evaluation criteria as proposals to re-deploy.

Canadian and/or international researchers who wish to apply are required to submit a letter of intent (two-pages maximum) to borrow POLARIS equipment, no later than 1, March 2005. The letter of intent should succinctly outline: 1) the number of instruments



requested; 2) the proposed location and time-frame for re-deployment; 3) the composition of the research team; 4) the scientific rationale for the proposed re-deployment; and, 5) the proposed funding source to cover the costs associated with the project. The POLARIS steering committee will consider all letters of intent and will notify applicants by 1 May, 2005 whether to submit a full proposal. The full proposal must address the same points in greater detail (maximum 5 pages), and must include CV's for all project investigators. Letters supporting the application may be included with full

proposals. Letters of intent and proposals in digital format (PDF format) should be emailed to: Dr. Isa Asudeh, at iasudeh@nrcan.gc.ca.

4. Terms of reference

4.1 Evaluation of proposals: Proposals will be vetted by an evaluation committee, struck for this purpose by the POLARIS steering committee. The evaluation committee will be composed of established researchers who are not in conflict of interest on the proposals submitted.

Proposals will be evaluated on the basis of scientific merit and feasibility. The POLARIS steering committee reserves the right to obtain the opinions of external expert referees concerning the scientific merit and feasibility of proposals. Preference will be given to studies that further the POLARIS mission of lithospheric analysis and research investigating seismicity and seismic hazards.

4.2 Equipment priority: In the case of proposals deemed to be of equal merit based on the evaluation criteria stated above, first priority will be given to members of the POLARIS consortium; second priority will be given to other Canadian researchers; non-Canadian Principal Investigators (PI's) are invited to apply, but must have a Canadian co-applicant from a CFI-eligible institution.

4.3 Fees: The POLARIS Steering Committee reserves the right to establish a fee structure that will include a one-time, per-station fee payable prior to redeployment, and an annual per-station fee. The first payment of the annual fee will be due prior to deployment and will be pro-rated to 31 March of the year of redeployment. Subsequent annual fee payments will be due before March 15 of each year of the redeployment.

The one-time per-station fees will be used by POLARIS to defray the costs of retrieval and(or) refurbishment of the equipment. The annual per-station fees will be used to defray the costs of satellite communications and infrastructure maintenance. To assist applicants in preparing budgets, the Steering Committee anticipates approximate values of CA \$3000 per station for the one-time user fee and CA \$2000 per station for the annual fee.

In some cases, the one-time fee associated with redeployment/refurbishment may be either increased or decreased at the discretion of the POLARIS steering committee, in order to accommodate unusual circumstances (for example, if the equipment is to be retrieved from a remote area accessible only by helicopter, the required fee may be higher). Guidance on possible deviations from the typical \$3000/station cost should be sought from the POLARIS steering committee through the POLARIS program manager (Dr. Isa Asudeh, iasudeh@nrcan.gc.ca).

4.4 Proposals to extend deployment: In the case of proposals to extend the deployment period at existing seismograph locations, the one-time per station fee will be waived.

4.5 Basic equipment: At each station the basic equipment will include a Guralp CMG-3ESP broadband seismometer with extended bandwidth (100 s to 50 Hz), a Nanometrics Libra digital VSAT seismograph, a satellite antenna ('dish') of diameter between 1.8m and 2.4m, a power subsystem with a minimum of 6x100 AH deep-cycle batteries and 6x75 PW solar panels, mounting equipment for the solar panels and satellite antenna, and various enclosures as required. For each station the approximate replacement value of this equipment is CA \$60K.

4.6 Deployment costs: The full cost of deployment (generally from POLARIS instrument centres in Ottawa or Victoria), installation and retrieval of equipment is the responsibility of the applicant. Applicants may wish to consult the POLARIS program manager to assist in developing a realistic budget for shipping the equipment.

Deployment costs include the travel costs from Ottawa or Victoria of at least one member of the POLARIS technical team to oversee installation of the instruments. For budget purposes applicants are advised that, under favourable conditions, a POLARIS station can be installed by 4 people in about 1.5 days, not including time to transport the equipment to the site.

4.7 Letter of notification: The POLARIS steering committee will provide successful applicants with a letter of notification that may be useful for securing funds from external agencies.

4.8 Availability: Instruments will be made available to successful applicants as soon as practical after the project budget has been secured, but no earlier than 1 October, 2005.

4.9 PI responsibility for the equipment: The PI is responsible for taking every reasonable precaution to safeguard the POLARIS field equipment from loss or damage. The PI's responsibility begins when the equipment leaves the POLARIS instrument facility, and ends upon return of the equipment.

4.10. Inter-institutional agreements: With the exception of PI's from the institutions that own the equipment, the PI's institution will need to enter into an inter-institutional agreement with the POLARIS Consortium.

4.11 Data access: Real-time data from all POLARIS deployments will be made available to any researcher through the POLARIS AutoDRM facilities managed by the Geological Survey of Canada.

4.12 Deployment duration: The maximum duration of deployment is three years, but may be extended at the discretion of the POLARIS steering committee