

GeoPRISMS Mini-workshop, EarthScope-type Canadian Cordillera Seismic Array and GPS Network

**December, 11, 2017
AGU Fall Meeting 2016
San Francisco, CA**

Organizers: Rick Aster (Colorado State University; chair), Pascal Audet (University of Ottawa), Katherine Boggs (Mount Royal University), Julie Elliott (Purdue University), Roy Hyndman (Pacific Geoscience Centre), Michael Schmidt (University of Calgary), Derek Schutt (Colorado State University)

On Sunday, December 11, an international and interdisciplinary group of ~50 researchers met in San Francisco under GeoPRISMS support to discuss emerging interest in a Canadian Cordillera Earth Observation Network. The network is conceived to holistically image broad Earth systems along the Pacific Plate Margin and Canadian Cordillera between Alaska and the U.S. Pacific Northwest. This initiative emerged out of four workshops and a planning meeting held in multiple locations in Canada over the last year, working with a broad range of U.S. and international collaborators. The San Francisco workshop pulled together interested researchers from across the U.S. and Canada, including representatives associated with from GeoPRISMS, IRIS, UNAVCO, NSF, industry, academic institutions, and a wide range of Canadian institutions.

After brief introductions by GeoPRISMS chair Damien Saffer (Penn State U.) and workshop chair, Rick Aster (Colorado State U.), Roy Hyndman (Pacific Geoscience Centre) began a sequence of overview talks, by outlining the fundamental tectonic questions ranging from ridge subduction at the north end of the Cascadian forearc, to the Yakutat mini-Himalaya collision along the Gulf of Alaska, to the Canning-Mackenzie overthrust in the Beaufort Sea. Hyndman noted the mainly dextral slip along the Queen Charlotte Fault has a recently revealed partitioned thrust component, as was recently illustrated by the 2012 Mw 7.8 Haida Gwaii earthquake which created a notable (but very sparsely observed) tsunami.

Pascal Audet (U. of Ottawa) presented an overview of existing seismic and other geophysical studies within the Canadian Cordillera, and pointed out the very significant geographic gaps in coverage. Broadly speaking, the proposed project can build on the exceptional legacy of LITHOPROBE across Canada. However, resolution of crustal and mantle structure across the region, and the understanding of seismicity and deformation, is comparable at best in many subregions to that of the western U.S. prior to the deployment USArray.

Talks by Lindsey Worthington (U. of New Mexico) and Julie Elliott (Purdue U), described the complex tectonic collisional and transpressional setting of the Gulf of Alaska plate margin. The eastern edge of the Yakutat Block is currently poorly defined, and seems to be driving deformation well into the interior of northern

Canada, resulting in a (presently very poorly imaged) Canning-Mackenzie overthrust in the Beaufort Sea, and the arcuate thrust belt of the Mackenzie Mountains, 700 to 1000 km from the plate boundary. Additionally, Julie Elliott pointed out the wide range of scientific and societal contributions that could be made by a larger permanent GNSS network in the region, including examining the deep earth, hydrosphere, cryosphere, atmosphere, industry, surveying/land use, agriculture, and natural hazards.

Mladen Ndemovic (Dalhousie U.) presented on the need for marine seismic surveys and instrumentation from the north end of the Cascadia forearc to the Alaskan Panhandle, as well as in the Beaufort Sea.

David Eaton (U. of Calgary) described induced seismicity in the Western Canadian Sedimentary Basin (WCSB) along the eastern margin of the Canadian Cordillera and its link with hydraulic fracturing. The importance of elastic stress changes in contributing to induced seismicity in the WCSB and improved understanding of induced seismicity could lead towards improving our general understanding of earthquakes, and to the conditions under which fracking can create appreciable earthquakes.

Kristin Morell (U. of Victoria) outlined the need for LIDAR, paleo-trenching, and detailed fieldwork to define active faults on Vancouver Island. Nicole West (Central Michigan University) provided an overview of the critical zone, and the need for critical zone monitoring in a range of tectonic and environmental regimes not covered in the US NSF-funded Critical Zone Observatories. It was noted that the critical zone is also the near-surface “geotechnical zone” which defines many aspects of seismic hazard, as well as a general zone of high-frequency seismic wave propagation complexity.

Frank Vernon (U. California, San Diego) and Eric Donovan (U. of Calgary) discussed motivations and benefits of a full geophysical suite of instrumentation at some sites, including for atmospheric sciences and ionosphere/magnetosphere/space physics. Donovan suggested opportunities for collaboration with the Canadian and European Space Agencies through the SWARM program as an example of a multi-national non-traditional research network that could be emulated within the proposed array.

Community discussion after the talks focused on possible next steps for international coordination to move potential projects forward. These details include timely exploration of partnerships that can strongly leverage funding, logistical, and potentially available equipment partnerships in step with the planned sunseting of current EarthScope USArray and other efforts in Alaska and far northwestern Canada.