

North American Earth Science Megaproject Continuum, Part 3: New Canadian EON-ROSE Program

Katherine Boggs¹, David Eaton², Thomas James³, Roy Hyndman³, Malaika Ulmi³, Pascal Audet⁴, Ed Johnston², Michael Sideris², Ron Clowes⁵, Julie Elliott⁶, Jeff Freymueller⁷, Paul Kushner⁸, Kristin Morell⁹, Derek Schutt¹⁰, Rick Aster¹⁰, Frank Vernon¹¹, Michael Hedlin¹¹, Catherine de Groot-Hedlin¹¹, Eric Donovan², Roland Stull⁵

¹Mount Royal University, kboggs@mtroyal.ca

²University of Calgary

³Geological Survey of Canada

⁴University of Ottawa

⁵University of British Columbia

⁶Purdue University

⁷University of Alaska Fairbanks

⁸University of Toronto

⁹University of California Santa Barbara

¹⁰Colorado State University

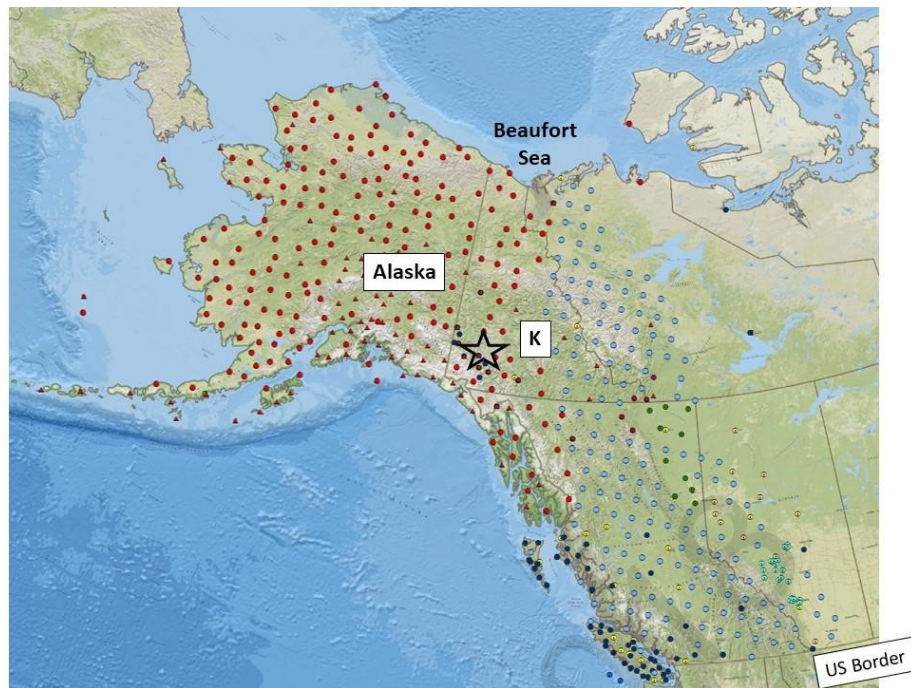
¹¹University of California San Diego

The proposed pan-Canadian EON-ROSE (Earth-System Observing Network - Réseau d'Observation du Système terrestre) initiative is being developed, in collaboration with the EarthScope community and other international partners, to undertake holistic examination of Earth Systems from the ionosphere through the atmosphere and lithosphere deep into the mantle (Boggs et al 2018). The first component of EON-ROSE will be CCArray (Canadian Cordillera Array, www.ccarray.org), a pilot initiative that will extend from the Beaufort Sea along the Canadian Cordilleran south to the US Border. The CC Array will build upon the unprecedented opportunities for technical, methodological, and scientific knowledge transfer presented by the coming completion of the US EarthScope program (www.earthscope.org), which currently has a grid of several hundred telemetered seismic, Global Navigational Satellite System (GNSS) and associated instruments across Alaska and northwestern Canada (Fig. 1). The resulting scientific advances in studies of the solid Earth structure, dynamics and hazards enabled by such largescale integrative networks of geophysical and other scientific instruments provide a strong foundation for driving innovative Earth science. CCArray also will continue and extend the interdisciplinary approach that contributed so much to the success of LITHOPROBE.

A foundational element of EON-ROSE is a uniform grid of Earth System Observation stations that will ultimately extend over Canada to achieve spatial coverage similar to the USArray component of EarthScope (Fig 2). These stations will be variably equipped with a suite of sensors including broadband seismometers (or ocean bottom seismometers), GNSS instrumentation, meteorological systems, permafrost monitors, atmospheric gas sensors, shallow borehole temperature and moisture sensors, riometers, gravimeters and magnetometers. Although many of the stations will be in place temporarily for up to three years, the intention is to leave some stations in place for long-term Earth and environmental monitoring and scientific research across Canada. It is expected that there also will be more detailed follow-up in areas of special interest with more closely-spaced station distributions (as with the EarthScope Flex Array), coupled with other geophysical surveys, field-based geological surveys and laboratory studies (as with LITHOPROBE). The first CCArray station was installed at Kluane Lake Research Station in the Yukon in July 2018.

References

Boggs, K.J.E., and 20 others, 2018, EON-ROSE and the Canadian Cordillera Array - Building bridges to span Earth System Science in Canada, *Geoscience Canada*, 45, 97-109.



#

Figure 1. Proposed ~165 Earth System observation stations for the Canadian Cordillera Array (CCArray) at an ~85 km spacing. The red triangles and circles are the current 193 USArray and 87 cooperative seismic, meteorological and infrasound stations in Alaska and northwestern Canada. The light blue circles are the proposed CCArray stations. The various other colours and symbols are broadband seismometers from a variety of academic and federal government groups (courtesy of S. Azeveda and R. Busby). K – Kluane Lake Research Station installed July 2018.

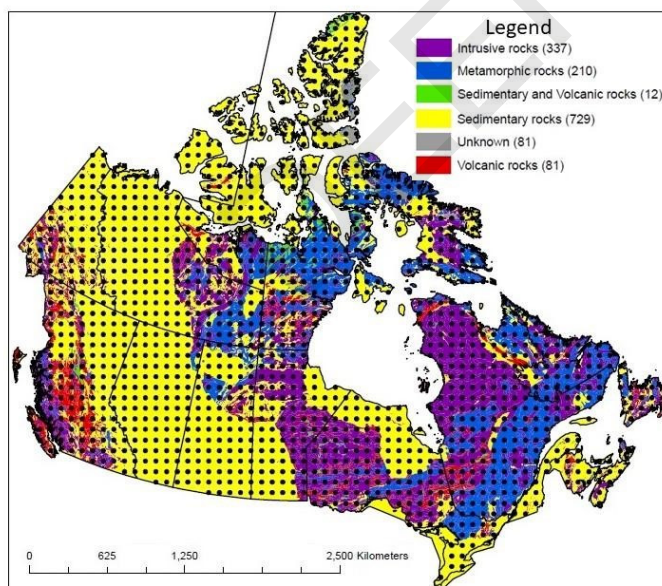


Figure 2. Schematic illustration of spatial coverage after completion of EON-ROSE using a ~85 km station spacing (courtesy of T. James).