Identification and Relocation of Earthquakes in the Sparsely Instrumented Mackenzie Mountain Region, Yukon and Northwest Territories, Canada

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The Mackenzie Mountain Range is an actively uplifting and seismogenic arcuate thrust belt lying within the Yukon and Northwest Territories. Seismic activity in the region is poorly constrained due to a historically very sparse seismograph distribution. In this study, new data is analyzed from the ~1000 km-long Mackenzie Mountains temporary (FDSN 7C) network located in the Cordillera-Craton region adjacent to and within the Mackenzie Mountains, in conjunction with Transportable Array and other sparse stations in the region. Using detection algorithms developed by *Kushnir et al*. [1998] and *Roecker et al*. [2006], signals are identified and subsequently associated across the network to identify events and establish phase onsets and estimate hypocenter locations. In this initial study, three months of data recorded from September – November 2016 is processed and compared to existing earthquake catalog records maintained by the USGS. Over 500 unique earthquakes are identified and located, more than 90% of which had not previously been detected. This study will further improve the regional earthquake catalog by detecting smaller-magnitude (~M 1.7) earthquakes with reasonable confidence. Future work on this project will require expanding the earthquake catalog to include all available data from the region during the two-year large-scale seismograph deployment, and to interpret seismicity and areas of uplift in the context of regional-scale faults and other geologic structures. Results from this study should provide new insight into the regions of active faulting within the Mackenzie Mountain uplift and to activity along large strike slip features, such as the Tintina Fault. Additionally, the Mackenzie Mountain region is identified as a high seismic hazard region, and results will inform understanding of the regional geology and seismicity from a hazards and risk perspective for northwestern Canada [*Natural Resources Canada*, 2015].

September 2016 Earthquake Detection