Regional scale 3D geological modelling of the New Québec Orogen, Kuujjuaq Region, Quebec

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An area of scientific and economic significance in the Canadian Shield is the southeastern Churchill Province in northeastern Québec and Labrador. The New Québec Orogen is noteworthy as it exposes a rare view of mid- to deep-crustal tectonic deformation during crustal accretion and hosts a number of mineral deposits and occurrences. Based on past and current exploration, this region has economic potential for iron, copper, nickel, platinum group elements, zinc, and cobalt. Recently, exploration efforts in the New Québec Orogen have been reinvigorated with new discoveries of gold and rare earth elements, drawing attention to this complexly deformed region. Despite this focus, there are no public sources of three-dimensional (3D) models to-date. To assist industry with exploration efforts and to improve geoscience knowledge of the New Québec Orogen, the Geological Survey of Canada (GSC), under its second Geo-mapping for Energy and Minerals (GEM2) initiative, in collaboration with the Ministère de l'Energie et des Resources Naturelles du Québec (MERN) will generate a regional-scale 3D model of the geometry and architecture of the crustal assemblages across the belt near Kuujjuaq, QC. This model will attempt to reconcile existing aeromagnetic surveys, airborne gravity surveys and field observations with cross section interpretations and deformation models collected by the GSC and MERN. This region was chosen because the GSC and MNRQ have developed a publically available, extensive and mature regional dataset which includes geophysical studies and surface observations, providing the necessary tools for 3D visualization. Additionally, this region is currently the target of new, multi-scale bedrock mapping by the MERN and GSC, and has locally preserved depositional structures and marker horizons, which provides further control on structural geometries. The 3D model will leverage existing data and expert knowledge to support the development of 3D perspectives and workflows that can be applied to other ancient orogens. The spatial relationships resolved through 3D modelling have the potential to provide a better understanding of deep crustal processes that occur during accretion tectonics in a transpressional regime.