



Reflection seismic studies in the Bathurst Mining Camp, Canada: Implications for crustal scale architecture and mineral potentials

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The Bathurst Mining Camp of northern New Brunswick, Canada is a major base-metal producing region that includes the super-giant Brunswick No. 12 and smaller size Brunswick No. 6 mines. Sustaining mining activity in the camp requires better understanding of crustal scale structures and mineral potential at depth. In such circumstances, reflection seismic data is instrumental for providing a framework allowing integration of other geophysical and geological data and allowing determination of new strategies for deep mineral exploration. In this work, we recovered, processed, modeled and interpreted a series of reflection seismic profiles with a total length of about 30 km acquired near the Brunswick No. 6 mine area. One of the main objectives of this survey is to provide key information on the geological structures associated with mineral deposits at depth. Although the data is acquired in crystalline environment, it shows an excellent data quality with a series of steeply dipping reflections imaged down to 9 km depth. The results demonstrate that reflection seismic imaging is particularly effective for imaging structures of the Brunswick No. 6 mine, many of which intersect the surface and thus allow for correlation with surface geology. Even more encouraging, the Brunswick horizon and associated iron mineralization are identifiable within a distinctive reflective package that can be used as a guide for deep base-metal exploration in the region. Two packages of dipping reflections appear to be in direct connection with mineralization that continues to depths greater than 9 km. A relatively high-amplitude reflection at depth of about 7 km is observed in all the seismic profiles and is interpreted as either a mafic-ultramafic sill intrusion or a granitic intrusion. Due to its geometrical shape and their presence in the study area, a granitic origin is a preferred interpretation. If this is the case, the granitic intrusion could have provided heat and hydrothermal fluids for mineralization in the Brunswick No. 6 mining area. The results from the seismic reflection data in combination with other geological and geophysical data have greatly improved our understanding of the tectonostratigraphic framework and architecture of the eastern part of the Bathurst Mining Camp.