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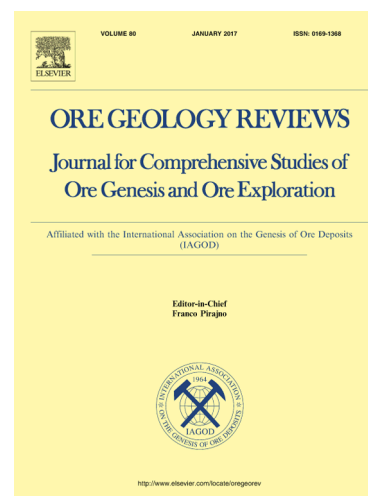
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**New constraints on genesis of the polymetallic veins at Port Radium,
Great Bear Lake, Northwest Canadian Shield**

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Abstract

The historic Eldorado U-Co-Ni-Cu-Ag veins at Port Radium are hosted by one of the arrays of northeast-trending quartz-filled brittle fault zones in the 1875–1855 Ma Great Bear magmatic zone. The veins formed in a lensoid segment of the fault, which underwent repeated reactivation that created subsidiary fractures, tensional openings, and breccia zones that were favourable for precipitation of multiple stages of ore minerals. The timing of ore precipitation is constrained by two swarms of diabase intrusions. The older ca. 1740 Ma Cleaver dikes predate the polymetallic mineralization and deposition of Mesoproterozoic strata of Hornby Bay Group. The ca. 1590 Ma Western Channel sheets postdate the main ore stages in the veins and intrude the lower strata of the Hornby Bay Group.

While diabase intrusions constrain ore precipitation to 1740–1590 Ma, in situ U-Pb analyses of fine-grained uraninite record isotopic resetting at 1453 ± 18 Ma. The $\delta^{18}\text{O}$ compositions of all uraninite stages range from -35.0 to -27.4 per mil, and reflect an overprint by late meteoric fluids. Chondrite-normalized rare earth element data for uraninite produce bell-shaped patterns centered on Sm-Dy, with slight negative Eu anomalies. The age constraints imposed by the dikes, $\delta^{18}\text{O}$ values and REE signatures of the early U and Co-Ni sulfarsenide stages indicate that the U and base metal mineralization at Port Radium is akin to the basement-hosted, polymetallic unconformity-related U deposits in the coeval Athabasca and Thelon basins. The 1453 Ma isotopic resetting builds to the growing body of evidence for a major event in

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