

## SCIENTIFIC COMMUNICATIONS

---

---

### LEAD ISOTOPE EVOLUTION OF MINERAL DEPOSITS IN THE PROTEROZOIC THROSSSELL GROUP, WESTERN AUSTRALIA

BRUCE R. ANDERSON,<sup>†,\*</sup> J. BRUCE GEMMELL,

*Centre for Ore Deposit Research, University of Tasmania, Hobart, Tasmania 7001, Australia*

AND DAVID R. NELSON

*Geological Survey of Western Australia, 100 Plain Street, Perth, Western Australia*

#### Abstract

The Meso-Neoproterozoic Throssell Group of the Paterson orogen in Western Australia hosts the Nifty and Maroochydore sediment-hosted, replacement Cu deposits, as well as subeconomic Pb-Cu-Au veins at Goosewacker, carbonate-hosted Zn-Pb at Warrabarty, and pyritic massive sulfide at Grevillea. We report new Pb isotope data for the Nifty deposit and the Rainbow and Grevillea prospects. These data are combined with published and unpublished data to characterize the Pb isotope signatures of the deposits and prospects in the Throssell Group. In addition these data are integrated into a model for the sources of Pb in the mineralizing systems.

Lead isotope data from mineralized occurrences in the Throssell Group plot as a linear trend in  $^{207}\text{Pb}/^{204}\text{Pb}$ - $^{206}\text{Pb}/^{204}\text{Pb}$  space. Deposits and prospects are arranged, from least to most radiogenic, as Rainbow, Warrabarty, Nifty, Goosewacker, and Maroochydore, along the trend. Secondary isochron or mixing isochron models were previously proposed to interpret the Pb isotope trend for mineral deposits and prospects in the Throssell Group. Our investigation shows that the linear trend does not represent an isochron due to the syngenetic (pre- $D_4$ ) timing for mineralization at Warrabarty and Rainbow compared to an epigenetic (syn- $D_4$ ) timing for Maroochydore, Nifty, and Goosewacker. We propose a source-mixing model, with no time dependency, to explain the deposit Pb isotope linear trend where Pb from a primitive, mantle source (Pilbara Craton,  $\mu = 9.88$ ) is mixed with crustal Pb (Throssell Group sedimentary rock derived from the Rudall Complex,  $\mu = 10.55$ ). The position of deposits and prospects along the trend suggests that the Warrabarty and Rainbow prospects have more primitive Pb and that the Maroochydore deposit contains Pb from primarily a crustal source. The Nifty deposit, and the Goosewacker and Grevillea prospects, contain a mixture of both primitive and crustal Pb.