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Framboids, Fluids, and Field Mapping: Understanding Sedimentary-Rock-Hosted Metal Prospectivity Across 11 Orders of Magnitude

Elizabeth C. Turner

Harquail School of Earth Sciences, Sudbury, ON, Canada

Research and mineral exploration in sedimentary-rock-hosted ore systems (e.g., Cu, Zn, Ni, Pb, Au), commonly focus on deposit-specific (10^{-1} to 10^3 m) grade distribution, alteration trends, and structural controls. However, the phenomena that control the nature and geographic distribution of sedimentary-rock-hosted ore systems and ore deposits span a range of scales from (for example) micron-scale (10^{-6}) porosity-permeability-mineralogy distribution to district-scale (10^5) tectonic events, stratigraphy, and fluid-migration patterns—scales that are seldom studied or meaningfully incorporated into exploration philosophies. Discovering new critical mineral deposits requires an expanded, more holistic approach that incorporates the full range of controlling factors. This talk explores the crucial importance of multiple scales of underappreciated controlling factors in several critical-mineral districts: the seemingly familiar Central African copperbelt and the more remote, underexplored Polaris Zn-Pb-Cu and Borden Basin (Nanisivik) Zn districts in Canada's high Arctic islands.