Goldschmidt 2025 Abstract
https://doi.org/10.7185/gold2025.27033

Applying a LIPs-Mantle Plume Paradigm to Exploration Targeting for a Wide Range of Commodity Types

RICHARD E. ERNST[1], HAFIDA EL BILALI[1], KENNETH L. BUCHAN[2] AND SIMON JOWITT[3]

[1]Carleton University, Ottawa
[2]Geological Survey of Canada, Ottawa
[3]University of Nevada Reno

There is a strong association between plume-generated LIPs and a range of ore deposit types [1,2]: 1) orthomagmatic, 2) hydrothermal (linked to fluid and heat from LIPs), 3) LIPs as barriers to fluid flow or reactive zones, 4) laterites rich in Al, Ni, Co produced from weathering of LIPs units (and related carbonatites), and 5) indirect links between LIPs and distal orogenic ore deposits through the plate tectonics framework.

Here we expand the linkages to consider the role of the architecture of LIPs [3], and to address the role of the dynamic effects of the mantle plume. There are four themes: 1) the architecture and magmatic pathways of the plume head region, and lessons for targeting of orthomagmatic ores [3]. 2) The role of the 90-degree stress transition from plume head uplift to plume head spreading to explain chonolith emplacement [4,5]. 3) Regional plume uplift affecting the orientation of hydrothermal ore deposits, and also causing tilting of sedimentary basins, resulting in sudden changes of the flow rate and direction of mineralized brines (relevant to sed-uranium, sed-copper, and potentially MVT and SEDEX). 4) Outward push of the spreading plume head on cratonic roots (‘plume push’) causing changes in plate movement that can lead to distal orogenic/subduction related mineralization (orogenic gold and potentially an influence on porphyry systems) [6,7]. For each aspect we develop exploration strategies. As a contribution to addressing the role of distal stresses in contributing to ore deposits, we are building global stress maps integrating radiating and circumferential dyke swarms, and plume centre locations (to identify locations of “plume push”) with robust reconstructions and identified times and locations of collision and subduction, for comparison with known orogenic gold deposits (and porphyry copper) and to identify prospective greenfield targets.

[1] Ernst, Jowitt (2013) SEG, SP17, 17-51. [2] Ernst, Jowitt (2017). In: TARGET2017, GSWA Record 2017/6, 41-44. [3] Ernst et al. 2019 JVGR, 384, 75–84. [4] Ernst et al. (2024) Econ. Geol., 119, 243–249. [5] Ernst et al. (2025) Econ. Geol. (in prep.). [6] Kuzmicz et al. (2023) Abstracts GAC-MAC-SGA. [7] Kuzmicz (2023). Unpublished B.Sc. thesis, Carleton University