# Tectonic triggers for giant porphyry and epithermal deposits of the circum-Pacific region

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Convergent margins around the circum-Pacific have been the sites for the formation of many of the world's largest porphyry Cu-Mo, porphyry Cu-Au and epithermal gold deposits since the Paleocene [1]. Cu-Mo porphyry deposits have formed primarily in the continental arcs of South and North America, whereas the Cu-Au porphyries are best developed in oceanic island arc settings, such as the Philippines and PNG-Irian Jaya. Epithermal gold deposits have formed in both continental and island arc environments, sometimes in association with porphyry systems (e.g., Phillipines) and in other cases with no known porphyry association (e.g., Japan, New Zealand).

In the last 15 million years, the formation of most of the giant porphyry and epithermal deposits around the circum-Pacific has occurred in regions where oceanic ridges, seamounts and/or oceanic plateaus have interacted with and/or been subducted beneath oceanic island arcs and continental arcs. In several examples, these tectonic perturbances have promoted flat slab subduction, crustal thickening, uplift and erosion and adakitic or adakite-like magmatism coeval with the formation of well-endowed porphyry and/or epithermal mineral provinces. Similar events have been inferred to be associated with the giant porphyry Cu-Mo provinces of Northern Chile (Eocene-Oligocene) and SW USA (Cretaceous-Paleocene). Some provinces have porphyry and/or epithermal mineralisation associated with alkalic magmatism on arc-normal fault systems (e.g., PNG).

Topographic and thermal anomalies on the downgoing slab appear to have acted as tectonic triggers for porphyry and epithermal ore formation. While such environments are not unique to the regions that contain giant porphyry and epithermal deposits, it is apparent that they can generate conditions favourable for the formation of giant magmatic-hydrothermal ore deposits. Furthermore, the rapid uplift and exhumation that can occur in conjunction with crustal thickening can promote superposition of epithermal mineralisation into the core of porphyry deposits, generating highly valuable hybrid porphyry-epithermal deposits such as Chuquicamata, Rosario and La Escondida (Chile).

**References**

[1] Cooke D.R., Hollings, P., and Walshe, J.L. (2005) *Econ Geol* **100,** 801-818.