Linking Porphyry Cu Formation to Tectonic Change in Postsubduction Settings: A Case Study from the Giant Yulong Belt, Eastern Tibet

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Porphyry deposits in magmatic arcs form coincident with changes to steady-state oceanic subduction conditions, such as changes in plate convergence rate and vector or angle of subduction. However, it remains unclear whether such processes also operated during formation of postsubduction porphyry deposits. The Yulong magmatic belt in the eastern Tibetan Plateau consists of middle to late Eocene igneous rocks (~51–35 Ma) that formed during the India-Asia collision, whereas all known porphyry deposits are associated with late Eocene rocks (43–35 Ma). A synthesis of new and published geochemical data shows marked variations from the middle to late Eocene, including increasing whole-rock La/Yb, Sr/Y, and EuN/EuN* values, as well as zircon EuN/EuN* values. These geochemical variations, together with petrographic observations, indicate a transition from plagioclase-dominated to amphibole-dominated fractionation from the middle to late Eocene. Coupled changes of magma compositions and porphyry Cu metallogeny from the middle to late Eocene coincided with, or were slightly preceded by, the onset of regional uplift and crustal thickening, triggered by the India-Asia hard collision and rapid deceleration of India-Asia convergence rate at ca. 50–44 Ma. Crustal thickening may have caused prolonged magma differentiation at greater depth and accumulation of dissolved H2O, which both contributed to amphibole-dominated fractionation and generation of hydrous melt that are prospective for porphyry Cu mineralization. Our study highlights the importance of tectonic changes in the formation of the Yulong and other postsubduction porphyry Cu belts, a scenario similar to that operated in subduction-related settings such as the Andes.