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Magmatic trends along the Peruvian Cordillera Oriental - probing the accretionary margin of the proto-Andean Western Gondwana

A. Miskovic (1), U. Schaltegger (1), J. Macharé (2), L. Seijas (3)

(1) Department of Mineralogy, University of Geneva, Rue des Maraîchers 13, CH 1205 Geneva, Switzerland, (2) INGEMMET, Av. Canadá 1470, Lima 41, Peru, (3) Compania Minera Poderosa S.A., Av. Primavera 834, Surco, Peru

Batholiths of the Eastern Cordillera of Peru exhibit profound variations in chemistry and timing of emplacement from north to south. As products of long-lived magmatic episodes, these plutons mark tectonic boundaries between the Western Amazonia and variable Proterozoic to Paleozoic crustal domains during the final assembly and the ultimate break-up of Pangea. A striking geochemical relationship exists between three principal plutonic belts: 1) Mississippian to Pennsylvanian, I-type, metaluminous, hornblende and magnetite dominated granitoids are restricted to the segment north of 10S, and display calc-alkaline evolutionary trends with elevated LILE/HFSE ratios characteristic of continental subduction zones; 2) Permian to Early Triassic, peraluminous, I to S-type, mica and ilmenite rich granitoids of the east-central Peru (10-13S), comagmatic with the bimodal tholeiitic lavas of the Mitu Group, are characterized by restricted bimodal compositional range, moderate Fe enrichments, low LILE/HFSE values, and higher Ga/Al ratios, all of which are associated with transitional (post)orogenic, within-plate suites; 3) Late Triassic-Early Jurassic, peralkaline, "Caledonian" I to A-type plutons of the southern Cordillera de Carabaya (13-15S) intrude the Mitu Gr. shoshonites, locally exhibit SiO2-undersaturated mineralogy characteristic of a shallow and dry source ($<$ 1 kbar H2O-saturated conditions), display extreme Fe enrichments, steep REE profiles, and overall low LILE/HFSE ratios. Combined Sr-Nd-Pb isotope systematics from all three intrusive provinces however, lack variation, and suggest uniformly large degrees of assimilation of the Proterozoic Amazonian basement. In addition to the systematic change in the plutonic chemistry, U/Pb and 39Ar/40Ar chronometry also reveal a general younging-southward trend. The

20 m.y. long magmatism associated with the Mississippian arc in the north-central Cordillera Oriental culminated between 336-325 Ma (Pataz batholith). It was followed by c.a. 40 m.y. hiatus briefly punctuated during a 314-312 Ma episode of orogenic Au-Ag mineralization associated with a period of tectonic uplift. Resumption of the Permo-Triassic magmatism (279-230 Ma) saw deposition of the bimodal Mitu Group volcanics, contemporaneously with the intrusion of the post-collisional plutons in the central Eastern Cordillera (Carrizal, San Ramon batholiths). Sporadic magmatic activity throughout Triassic was marked by eruption of progressively more alkalic Mitu lavas and initiation of the A-type plutonism, reaching zenith between 216-205 Ma in the southernmost Carabaya Batholith. The 188 Ma old alkaline magmas of the Allincapac complex in the SE Peru mark the latest and most enriched pulse of anorogenic magmatism. Our preliminary geodynamic model envisions an originally orthogonal eastward subduction of the paleo-Pacific crust below the Western Gondwana during the Late Devonian. The convergence became strongly oblique towards southeast in the Late Carboniferous, thus imposing a sinistral strike-slip stress regime on the western Amazonian margin. Accretion of a buoyant segment of mafic crust (oceanic plateau and/or island-arc root) eventually plugged the subduction zone. This scenario explains both the “craton- free” basement underlying the present Western Cordillera of northern Peru and the sudden termination of arc-related magmatism along the northern Cordillera Oriental in Pennsylvanian. Subsequent uplift and eventual relaxation of the cratonic margin facilitated emplacement of the central, supracrustal, S-type granitoids in mid-to-late Permian. The progressive strike-slip duplexing, development of transtensional ensialic basins filled with the Mitu molasses, and subsequent back-arc extension in Permian occurred along the inherited suture between the Gondwanan craton and the Arequipa-Antofalla terrane.