

GEOLOGICAL FEATURES AND PETROLOGICAL INTERPRETATION OF THE CENOZOIC VOLCANISM FROM THE SAJAMA REGION, WESTERN ANDES OF BOLIVIA

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ABSTRACT

The Cenozoic volcanism of the Sajama region (18°S, 69°W), situated in the western Andes of Bolivia near the Chilean border, consists of two main extrusive suites. An alkaline suite of Late Oligocene-Lower Miocene age is characterized by the occurrence of mugearitic lavas, basanites and alkali-basalts belonging to the syn-rift Abaroa Formation. In contrast, a widespread high-K calc-alkaline suite is mostly composed of volcanic rocks erupted during the Upper Miocene - Holocene period. Among them, the Upper Pliocene rhyolitic welded tuffs from the Perez Formation underlie the trachydacite lavas and tuffs of the Sajama resurgent caldera and related parasitic cones of a suggested Pleistocene age. These rhyolitic welded tuffs also underlie the trachyandesite lavas of the Nevados de Payachata volcanoes.

The volcanic rocks of the Sajama quadrangle display a wide silica range (52-77 SiO₂ %), high K₂O /Na₂O ratios, high Differentiation Indexes and low corundum normative values, corresponding to their meta-aluminous composition. The peraluminous rhyolitic welded tuffs and ignimbrites of the Perez Formation exhibit features of the 'S-type' volcanics of crustal origin. The Harker type diagrams of the Sajama volcanics represent a considerable increase in their potassium contents, and also MgO, CaO and FeO depletions in their evolved terms (rhyolites). These characteristics have been interpreted as the result of a magmatic differentiation process of a parental magma of tholeiitic composition, linked to the high-angle subduction of the Nazca plate beneath this segment of the Central Andes of South America. The trachydacites and trachyandesite lavas of the Nevados de Payachata volcanoes (Parinacota and Pomerape) have originated by magma-mixing, according to the available geochemical and isotopic evidence.