Magmatic differentiation at La Poruña scoria cone, Central Andes, northern Chile: Evidence for assimilation during turbulent ascent processes, and genetic links with mafic eruptions at adjacent San Pedro volcano

González-Maurel, Osvaldo

Godoy, Benigno

le Roux, Petrus

Rodríguez, Inés

Marín, Carolina

Menzies, Andrew

Bertin, Daniel

Morata, Diego

Vargas, Marina

La Poruña (21°53?S; 68°30?W) is a 140 m high scoria cone composed of pyroclastic material and an extensive basaltic-andesite to andesite lava flow that is up to 8 km in length. Automated mineralogical analysis describes a suite of porphyritic mafic samples, comprising olivine- and pyroxene-bearing rocks. Well-defined major element compositional trends, as well as trace and rare earth element characteristics (e.g. Sr/Y < 47; Sm/Yb < 4), likely reflect magmatic differentiation at middle-upper crustal levels. Additionally, magma mixing and assimilation and fractional crystallization processes act on these La Poruña magmas within the thickened continental crust, which is typical in Andean volcanic systems. A remarkable compositional feature is the unusual reversed isotopic behaviour of increasing silica with decreasing 87Sr/86Sr compositions. In a process of crustal assimilation during turbulent magma ascent (ATA), the least differentiated rocks are the most contaminated ones since the turbulent hottest magmas effectively assimilate the crustal material. We relate the inverse Sr isotope trend to latter magmatic evolution involving ATA at shallow crustal levels prior to eruption, therefore differing from the broadly accepted Central Andean magmatic model. The older volcanics (>96 ka) from San Pedro volcano exhibit similar isotopic

characteristics, therefore evidence of similar magmatic processes. This new dataset clearly defines magma compositional changes during the La Poruña eruption (ca. 100 ka), revealing an increase in crustal contamination at shallow crustal levels for the younger San Pedro lavas (<96 ka), likely controlled by increasing amounts of deep-sourced basaltic input over time.