Cities on Volcanoes 9
November 20-25, 2016
Puerto Varas, Chile
'Understanding volcanoes and society: the key for risk mitigation'

Evidence for a large resurgent caldera system at Incahuasi (southern Ayacucho Province, Perú)

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Keywords: Incahuasi caldera, ignimbrites, collapse system, resurgent dome, laguna de Parinacochas

The Central Volcanic Zone (CVZ) of the Andes exposes many large-volume silicic ignimbrites of Cenozoic age. While the source calderas of many CVZ ignimbrites have been identified, many others are still unknown, notably in Ayacucho, Arequipa, and Moquegua provinces, southern Peru. Here we describe for the first time a large resurgent caldera in Southern Ayacucho province (region between Coracora, Jaqui and Pauza), where geothermal-epithermal economic potentials might exist. Our geological and remote sensing study identifies a low and flat area at Laguna de Parinacochas (3278 m asl), a ~10 x 8 km-wide salar (salt lake) roughly crescent-shaped in map view that is surrounded by ridges that culminates at about 3600 m asl. On its western side of the salar, the ridge mainly exposes altered whitish-yellowish non-welded ignimbrite units, with local sliding features towards the salar. The ridge east of Laguna de Parinacochas shows a set of faults at the NW base of Sara Sara volcano, with collapse towards Laguna de Parinacochas lowlands. We interpret these topographic and structural features around the salar as the southern part of a larger caldera system. Consistently, lacustrine successions in the area point to sedimentation into a caldera lake. Strongly altered areas with kaolin and silicified fields, fluid circulations, hot springs, bubbling, and sulfur smells occur mainly on and near the edge of a vast structure that evidence a major ~25 x 35 km-wide elliptical collapse system that we call the Incahuasi caldera. In addition, several structural features indicate that the massif (size: 16 x 18 km; height > 1 km) located north of Laguna de Parinacochas witnessed a significant uplift that cannot be fully explained by tectonic processes: we interpret it as a large resurgent dome structure that bulged with an apical graben in the center of the Incahuasi caldera.