

Temporal evolution of long-lived magmatic systems: the Chachani volcano complex, south of Perù

Rigoberto Aguilar^{1,2}, Jean-Claude Thouret², Pablo Samaniego², Brian Jicha³, Jean-Louis Paquette²

¹*Observatorio Vulcanológico del INGEMMET, Arequipa, Perú*

²*Laboratoire Magmas et Volcans, Université Clermont-Auvergne, IRD et CNRS, Aubière, France*

³*Department of Geoscience, University of Wisconsin-Madison, USA*

The Chachani Volcanic Complex (CVC) is an extensive (~289±10 km³) assemblage of spatially, temporally and genetically related major and minor eruptive centers. The c. 1.2 Myr-long activity suggests that the CVC is a long-lived volcanic system characterized by semi-persistent activity and short periods of quiescence.

The stratigraphy, Ar/Ar and U/Pb chronology, spatial distribution along lineaments, and the degree of landform preservation help distinguish two groups of edifices in the CVC. The 'old' edifice group is characterized by large stratovolcanoes and small dome coulees. This group has been built between <1200 and 641 ka in the northeastern part of the complex, following a N150°-N160° arcuate spatial trend with eroded ridges oriented to the NNW-SSE and amphitheaters (glacial cirques and collapse scars) open to west and southwest.

The 'young' group has formed a 12.5-km long ridge, trending N80°, located S/SW of the 'old' edifice group. Eruptive activity between 463 and 56 ka has produced cumulo-domes, dome coulees, block lava flow fields, composite cones and stratocones. Voluminous block- and-ash deposits on the southern flank and a lava dome in the central part of the complex are also associated with this group. One substantial chronological gap of ~180 kyrs may have occurred between the 'old' and 'young' edifices.

The 'young' group volcano eruption rates (0.08-0.09 km³/ka) are two to three times slower than the 'old' group eruption rates (0.15-0.24 km³/ka). The 'young' group of edifices suggest a change towards an extrusive style of eruptions as domes, dome coulees and extensive lava fields dominate the most recent CVC eruptive history. In contrast, the 'old' edifice group consists of stratovolcanoes with voluminous lava flows and small volumes of pyroclastic deposits that have been subjected to glacial erosion and a wetter climate than today.