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Geomorphologic map and derived geomorphological evolution model of the Ampato volcanic complex (Southern Peru).

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In this work we present the evolution of the Ampato volcanic complex (15º24′-15º 51′S, 73ºW; 6.288 m asl) from a geomorphological perspective based on the analysis of landforms, both volcanic and derived from cold processes such as moraines and rock glaciers. In order to do so, a detailed 1:20.000 scale geomorphological map was elaborated by integrating the following techniques: the interpretation of the 1:35.000 scale aerial photographs (Instituto Geográfico Nacional de Perú, 1956) and the analysis of satellite images (Mrsid; NASA, 2000). The cartography was corrected through field work campaigns. A geomorphological cross-section traversing the map from North to South was elaborated in order facilitate the interpretation of the landforms.

From the thorough analysis of the landforms represented in the geomorphological map and their relative position we have identified six main volcanic phases, mainly constructive but also, to a lesser extent, destructive (related with a Sant. Helens eruption), interspersed by five large glacial phases. From the three andesitic stratovolcanoes that form the complex (HualcaHualca, Sabancaya and Ampato) we suggest that the oldest of them is HualcaHualca representing the first step of the process over which the other units were placed. The most recent phase corresponds to the main cone of Sabancaya and its sets of domes and large lavas flows. Also we have detected a number of well-preserved vents on the Southern slope of volcano HualcaHualca close to the 1955 glacier tongues. Their presence is an evidence of recent volcanic activity in a volcano considered extinct.

The glacial activity has been very active during the Quaternary on the Ampato Complex. The most ancient glacial phase is linked to the Last Glacial Maximum of the Pleistocene. During this event, the paleoglaciers descended down to 3650 m asl and builted moraines of 25- 30 m height. The most recent advance is related to the global event known as Little Ice Age (LIA) but its impact was limited. We have recognised moraines located at 5300 m asl, 1650 m above the Last Glacial Maximum moraines. Finally, it is worth noting the existence of rock glaciers under the steep walls to the South and Southwest, between 4600 and 5500 m asl.

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