Glacial evolution in the Ampato - Sabancaya - Hualcahualca volcanic complex (southern Peru)

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The Ampato-Sabancaya-Hualcahualca mountain system (lat 15° 24´ - 15° 51´ S, long 71° 51´ - 73° W) is located in the southern sector of the western range of the Peruvian Andes to the northwest of the city of Arequipa. The highest peak in the range is Ampato (6268 m), a high stratovolcano.

The most recent eruptive events associated with the active volcanic area occurred in 1986 and 2000 on Nevado Sabancaya (6025 m) (Thouret et al. 1994, 1995). Throughout the late Pleistocene and the Holocene, volcanic activity interfered with the glacier mass, triggering large mass movements, as evidence by the lahar that formed in the snowfields on Sabancaya and Hualcahualca stratovolcanos and travelled down nearby valleys. Those originating on Hualcahualca were channelled by the Sepina River into the deep Colca Valley located to the north of the volcanic complex.

The purpose of this study was to produce geomorphologic cartography that would depict and delimit the morainic complexes of this group of stratovolcanoes, the volcanic formations, and the landforms generated by the interaction of volcanic activity and glaciers.

A digital topographic scale of 1:100.000 was along with aerial photographs from 1955 American reconnaissance flights and Landsat satellite images from 1990 and 2000. All of the information was stored and processed in a Geographic Information System (GIS), using ArcGis and ArcView software and used to generate several Digital Elevation Models that depict changes in the complex at each stage. The processing and comparisons made with these Digital Elevation Model (DEMs), enabled us to detect anomalies triggered by volcanic activity.

Three distinct glacial periods are customarily cited for this area, the oldest of which pertains to the Last Glacial Maximum that reached 4300 m altitude and during which the oldest moraines that we mapped were deposited; the Late-Glacial period during which the equilibrium-line was located at about 4800 m; and the Little Ice Age is associated with the most recent moraines located at the highest altitudes. The equilibrium line during this last phase reached 5100-5200 m altitude (Lamadon, 1999).

The morainic deposits identified using digital topography, aerial photography and satellite image interpretation will be analyzed in future fieldwork and samples will be taken to determine their age by absolute dating. The findings will be used to produce a more reliable chronological sequencing of the glacial phases in this sector of the Peruvian Andes. In the abstract we present the results of partial geomorphologic mapping of the northeast of Hualcahualca volcano (figure 1, 2 and 3).

The results of this research were compared to findings obtained at Coropuna, a stratovolcano located 200 km to the north of the study site, to determine whether the glaciers at both volcanic complexes behaved similarly during the Quaternary, in the context of the Lahar Project (www.ucm.es/info/agr/lahar.html).

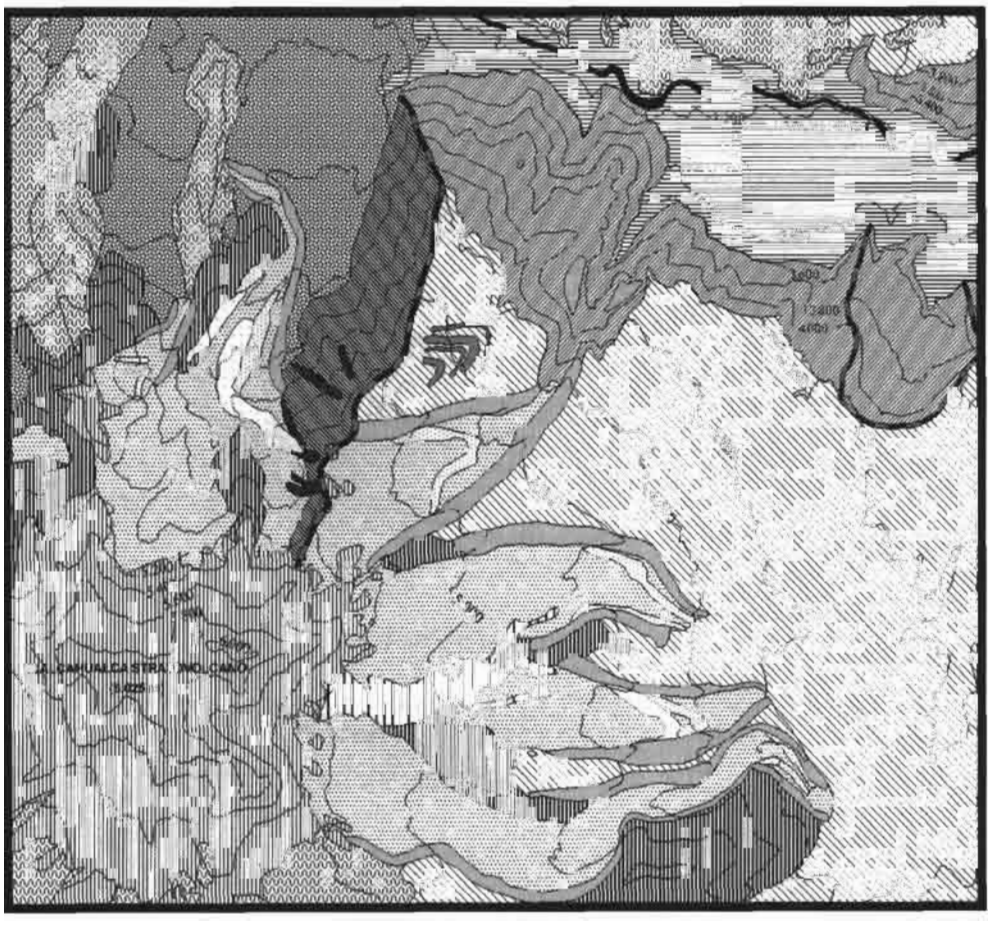
EL CAMUALCASTRA
NO. CAÑO

FIGURE 2

DIGITAL ELEVATION MODEL OF THE HUALCAHUALCA STRATOVOLCANO AREA

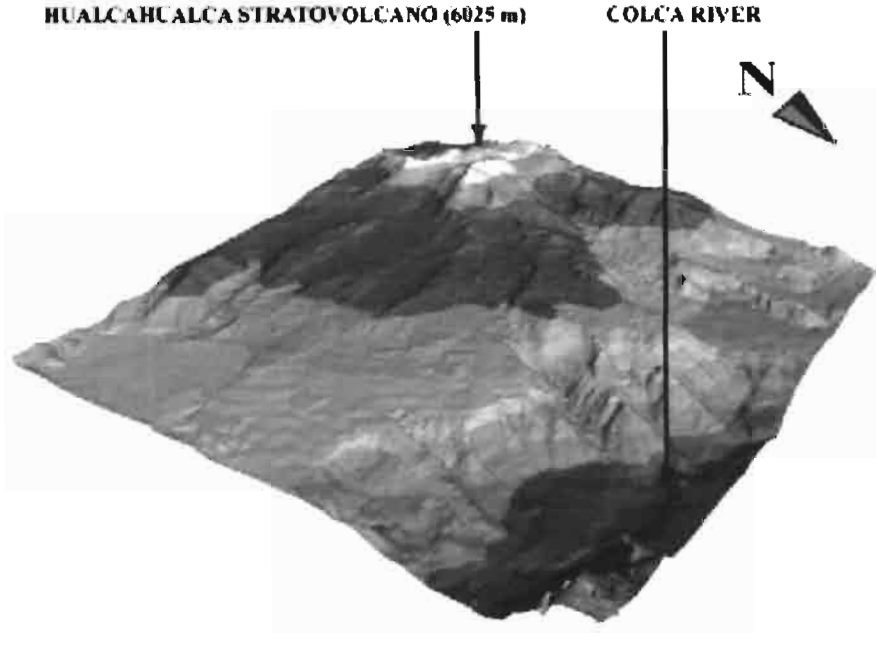

FIGURE 3

LANDSAT SATELLITE IMAGE FROM 2000 ON 3D HUALCAHUALCA STRATOVOLCANO AREA