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Volcanic and glacial evolution of Chachani-Nocarane complex (Southern Peru) deduced from the geomorphologic map.

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The Chachani-Nocarane (16°11'S; 71°31'W; 6.057 m asl) is a large volcanic complex located in the western Central-Andean Cordillera, South of Peru. The date of the last eruption is not known and there are no registers of recent volcanic activity. The complex is shaped by glacial forms belonging to different phases, and periglacial forms (several generations of rock glaciers) which alternate with volcanic forms.

The aim of this research is to establish the glacio-volcanic evolution of the volcanic complex Chachani-Nocarane. In order to do so, a detailed 1:20.000 scale geomorphological map was elaborated by integrating the following techniques: interpretation of the 1:35.000 scale aerial photographs (Instituto Geográfico Nacional de Perú, 1956) and the analysis of satellite images (Mrsid; NASA, 2000). Finally, the cartography was corrected though field work campaigns.

Through the geomorphologic analysis of the landforms and their relative position, we have identified twelve phases, seven volcanic and five glacial phases. The most ancient volcanic phase is locate to the north area of the study area and correspond with Nocarane and Chingana volcanoes, alignment NW-SE. Above those ensemble the rest of the large delimited geomorphological units overlap. The most recent is located to the SW and consists of a complex series of domes, lava cones and voluminous lavas.

Within the glacial phases, the most ancient one is related to the Last Glacial Maximum during the Pleistocene. Over this period, glaciers formed moraines from 3150 to 3600 m asl. The most recent glacier pulsation corresponds to the Little Ice Age (LIA). The moraines related to that event are the closest to the summits, located between 5.100 and 5.300 m asl, and they represent the last trace of glacial activity on the volcanic complex.

Currently, this tropical mountain does not have glaciers. The only solid-state water reserves are found in the form of permafrost, as shown by various generations of rock glaciers placed in the upper part of the mountain, between 4.300 and 5.400 m asl in Nevado Nocarane and between 4.350 and 5.100 m asl in Nevado Chachani. Most of the delimited rock glaciers were formed under vertical walls where the supply of detritus material is significant. The generation of rock glaciers found at a higher altitude presents geomorphological indicators of current activity.

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