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Eruptive chronology and volcanic hazard map of Tutupava volcanic complex (Southern Peru)

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The Tutupaca Volcanic Complex (CVT) is an almost unknown volcanic center located in the Central Andean Volcanic Zone in southern Peru. The CVT is constructed of three successive edifices. The basal Tutupaca is a mostly eroded and altered, andesitic lavic edifice. New 40K-40Ar ages constrain its evolution between 1100 and 750 ka. On the remnants of this edifice, two twin peaks were developed (Western and Eastern Tutupaca). The Western Tutupaca consists of dacitic domes, one of which was dated at 30-35 ka. This edifice was affected by late Pleistocene glaciations, dated at 18-24 ka. A sequence of large explosive tephra fallout deposits, younger than 10-12 ka, were associated with this edifice. Lastly, the Eastern Tutupaca is a dacitic dome complex constructed on the remnants of the Basal and Western edifices. This edifice is exempt of glacial erosion suggesting a Holocene age. Eastern Tutupaca were affected by at least two sector collapses. The last eruption of this edifice was characterized by a conspicuous debris avalanche which was accompanied by a large explosive eruption that have been dated at 218 ± 14 yBP, certainly corresponding to an eruption that occurred in 1802 AD (Samaniego et al., 2015). Using this information, we constructed a hazard map based on the following eruptive scenarios: (1) Lava dome growth and its subsequent collapse to generate pyroclastic flows. This scenario is based on the block-and-ash flow deposit emplaced during the last eruptive phase. (2) Lava dome growth accompanied by edifice destabilization and triggering of debris avalanches. This scenario is based on two sector collapses that affected Eastern Tutupaca during Holocene. (3) A laterally-directed explosive eruption, similar to the last historical eruption of Tutupaca that emplaced pyroclastic flows deposits that reached more than 10 km. An additional scenario includes the generation of primary or secondary lahars.