

## The eruptive chronology of the Yucamane-Calientes compound volcano: a potentially active edifice of the Central Andes (Southern Peru)

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We have reconstructed the eruptive chronology of the Yucamane–Calientes compound volcano in southern Peru based on extensive fieldwork and a large dataset of geochronological (40K–40Ar, 40Ar–39Ar, U–Pb and 14C) and geochemical (major and trace element) analyses. This compound volcano is composed of two edifices that have experienced discontinuous volcanic activity from the Middle Pleistocene to the Holocene. The Calientes volcano has been constructed in four successive stages: Calientes I is composed of andesitic lava flows that were dated at ~500 ka. Then, the Callazas ignimbrite (Calientes II stage) was emplaced (~160–190 ka), followed by the main cone-building stage (Calientes III), which was dated at ~125 ka. Finally, the Holocene Caliente domes were emplaced and represent the last eruptive products of this edifice. The Yucamane volcano has been constructed in three stages: Yucamane I stage consists of a sequence of andesitic lava flows exposed at the base of the volcano with an age older than 37–40 ka. Yucamane II stage (~36–24 ka) comprises a thick sequence of block-and-ash deposits that represents a dome-growth episode that predates the younger Yucamane cone (Yucamane III stage) since 20–25 ka. During the Holocene, the Yucamane had shown vulcanian to sub-Plinian activity resulting in the emplacement of tephra fallout and pyroclastic density current deposits. The last sub-Plinian eruption occurred ca. 3085 ± 35 aBP and emitted a pumice fall deposit associated with a pumice flow deposit. Most samples from the Calientes volcano are andesites and dacites (60.1–67.7 wt.% SiO<sub>2</sub>), while rocks of the Yucamane volcano correspond to basic andesites to dacites (53.4–66.9 wt.% SiO<sub>2</sub>). These rocks show a mineral assemblage of plagioclase, amphibole, biotite, ortho- and clino-pyroxene, olivine, and Fe–Ti oxides. All of the analyzed samples belong to a high-K, calc-alkaline series. Calientes volcano erupted mostly andesitic magmas and is punctuated by rare eruptions involving silica-rich magmas. In contrast, Yucamane volcano displays a different pattern, characterized by a gradual decrease of silica content through post-glacial time, from moderate (VEI ≤ 2) vulcanian events comprising basic andesitic magmas to the large (VEI 3) sub-Plinian eruption of ~3 ka, involving andesitic magma. On the basis of this recurrent low-to-moderate explosive activity, Yucamane must be considered as an active and potentially threatening volcano, which may affect the province of Candarave with about 12 000 inhabitants.