Physical impacts of the AD 1600 Huaynaputina VEI 6 eruption on habitat and infrastructure, southern Perù: Geophysical insights from the Huayruro project

Philippe Labazuy[1], Franck Donnadieu[1], Jean-Claude Thouret[1], Domingo Ramos[2], Jersy Marino[2], Neldy Paula Sanchez[2], Ivonne Lazarte[2], Saida Japura[2]

[1]*UCA-OPGC-IRD-LMV Clermont-Ferrand, France*
[2]*INGEMMET OVI Arequipa, Perù*

The Huayruro project aims at better understanding the physical and socio-economic impacts of the CE 1600 Plinian eruption of Huaynaputina in south Peru (VEI 6, 11-14 km^3). Despite its global climatic impact, its regional consequences on the Inca population and constructions have been scarcely studied. In particular, the location of ten to fifteen settlements buried by the erupted deposits is not accurately known. Finizola et al. (2018) identified several buried settlements and ruins during several archeological and geophysical surveys during the 2014-2017 period within a 16 km radius of the crater (Coporaque, Calicanto, and Chimpapampa). Extending their work in May 2018, we used ground- penetrating radar at 400 et 200 MHz, magnetic gradiometry, multi-frequency conductivimetry and Structure from Motion (SfM) photogrammetry with multi-view stereo to further explore the sites of Coporaque (12 km WSW of the crater), Estagagache (16 km SSE) and San Juan de Dios (17 km SW), affected by fallout deposits 2.6, 1.5 and 0.4 m thick, respectively.

The present study provides spatial constraints for mapping buried house walls, cultivated terraces, rural infrastructure such as grain storage areas, contributing therefore to delineate the extent of the damaged villages. Such geophysical surveys combined with aerial imagery, high-spatial resolution DEMs and tephra studies help to focus on adequate sites for future archeological excavations and assess physical impacts of thick tephras and PDCs deposits on pre-Conquest constructions. The ultimate goal of the Huayruro project is to disseminate volcanic risk knowledge and help create one in situ museum to be built up on the site of Calicanto.