



The ash deposits of the 4200 BP Cerro Blanco eruption: the largest Holocene eruption of the Central Andes

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We present new data about a major eruption -spreading approx. 110 km³ ashes over 440.000 km²- long thought to have occurred around 4200 years ago in the Cerro Blanco Volcanic Complex (CBVC) in the Central Andes of NW Argentina (Southern Puna, 26°45' S, 67°45' W). This eruption may be the biggest during the past five millennia in the Central Volcanic Zone of the Andes, and possibly one of the largest Holocene eruptions in the world.

Discrimination and correlation of pyroclastic deposits of this eruption of Cerro Blanco was conducted comparing samples of proximal (domes, pyroclastic flow and fall deposits) with distal ash fall deposits (up to 400 km from de vent). They have been characterized using optical and electron microscopy (SEM), X-ray diffraction, particle-size distribution by laser diffraction and electron microprobe and HR-ICP-MS with laser ablation for major and trace element composition of glass, feldspars and biotite. New and published 14C ages were calibrated using Bayesian statistics. An one-at-a-time inversion method was used to reconstruct the eruption conditions using the Tephra2 code (Bonadonna et al. 2010, <https://vhub.org/resources/tephra2>). This method allowed setting the main features of the eruption that explains the field observations in terms of thickness and grain size distributions of the ash fall deposit.

The main arguments that justify the correlation are four: 1) Compositional coincidence for glass, feldspars, and biotite in proximal and distal materials; 2) Stratigraphic and geomorphological relationships, including structure and thickness variation of the distal deposits; 3) Geochronological consistency, matching proximal and distal ages; and 4) Geographical distribution of correlated outcrops in relation to the eruption centre at the coordinates of Cerro Blanco.

With a magnitude of 7.0 and a volcanic explosivity index or VEI 7, this eruption of ~4200 BP at Cerro Blanco is the largest in the last five millennia known in the Central Volcanic Zone of the Andes. The implications of these results go far beyond having an excellent chronostratigraphic marker to reconstruct the Holocene geologic history of a large area of South America. Besides the effects directly associated with eruptive process, a deposit of tephra is very ephemeral and rapidly is reworked and redeposited. The interaction of the huge amount of ashes of this eruption with the wind and water in the large watersheds of the region must mobilize enormous amounts of both particulate and chemical elements to the large Chacopampean Plain. How impacted this eruption on the environmental, pollen, faunal and archaeological mid-Holocene records are features currently under study. On the other hand, the occurrence of Holocene volcanism in the southern Puna leads to consider new scenarios of volcanic hazard over large and densely populated areas in South America.

Financial support was provided by the QUECA Project (MINECO, CGL2011-23307). Part of the analytical work was carried out in the Geochemistry Facility of labGEOTOP in the ICTJA-CSIC, infrastructure co-funded by ERDF-EU (Ref. CSIC08-4E-001).