



## **A large eruption convulsed in prehistoric times an extensive area of Catamarca, Southern Central Andes, NW Argentina**

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Geomorphological, stratigraphical, mineralogical and chemical characteristics of many recent 30-160 cm ash deposits occurring at the Bolsón de Fiambalá in Catamarca, NW Argentina, allow their correlation. This lithostratigraphic unit is named Fiambalá Ash and it is uncovered or covered by colluvial deposits and present-day aeolian deposits, reworked products of the primary fall deposits. The grain size of these ash deposits is gritty rather than silty. They are nearly unique among regional ashes in containing hornblende phenocrysts. In addition, they are made up of glass (subangular blocky shards), feldspars, biotite, and quartz; magnetite, ilmenite, apatite and titanite are scarce. The glass is rhyolitic ( $\sim 75$  to  $79$  % m/m  $\text{SiO}_2$ ;  $\sim 3$  to  $4$  % m/m  $\text{Na}_2\text{O}$ ;  $\sim 3$  to  $5$  % m/m  $\text{K}_2\text{O}$ ;  $1$  to  $2$  % m/m  $\text{CaO}$ ; normalized to  $100$  %). On the other hand, in northern margins of Fiambalá basin, extensive remnants of fines-poor pumiceous debris flows and hyperconcentrated sandflow deposits as thick as  $10$  m are exposed on the walls of the river gorges, where the base is usually covered, e.g., Chuquisaca River. There is no significant unconformity or intercalation of other materials, thus suggesting rapid emplacement after a single eruptive event. A preliminary age of Fiambalá Ash based on archaeological studies bracket it between  $1400$ - $1270$  and  $1270$ - $980$  cal a BP (OxCal 4.2.4, SHCal13, 2 sigma).

The geographical distribution, the geomorphological features observed in satellite images and the information on the main trends of the stratigraphy, the abundance of hornblende and biotite in the younger proximal ash fall deposits, ignimbrites and lava-domes of the Nevado Tres Cruces complex, favours this edifice as the strongest candidate to be the source of the Upper Holocene pyroclastic deposits found in the Fiambalá basin.

The archaeological records seem to evidence the abrupt environmental and societal changes associated with this major eruption. Significant areas of Catamarca were likely rendered uninhabitable, being dramatic the socio-economic and environmental consequences for generations. However, the resilience was high, as evidenced by the relatively quick reintroduction of cultivated fields. The understanding of these impacts could provide valuable insights to manage volcanic hazards related to large explosive eruptions.

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