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The Cerro Aguas Calientes caldera, NW Argentina: an example of a tectonically controlled, polygenetic, collapse caldera, and its regional significance

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Polygenetic, silicic collapse calderas such as Cerro Galán, Pastos Grandes, La Pacana, Vilama, Negra Muerta, Farallón Negro, Cerro Guacha, among others are common in the central Andes. Here we describe in detail the Cerro Aguas Calientes caldera in NW Argentina, which comprises two caldera-forming episodes occurred at 17.15 Ma and 10.3 Ma, respectively. We analyse the significance of its structural setting, composition, size and the subsidence style of both caldera episodes. Our results reveal that the caldera eruptions had a tectonic trigger. In both cases, an homogeneous dacitic crystal-rich (>60 vol. % of crystals) reservoir of batholitic size became unstable due to the effect of increasing regional transpression, favouring local dilation throughout minor strike slip faults from which ring faults nucleated and permitted caldera collapse.

Both episodes are similar in shape, location and products of the resulting calderas. The 17.15 Ma caldera has an elliptical shape (17 $\times$ 14 km) and is elongated in a N30º trend; both intracaldera and extracaldera ignimbrites covered an area of around 620 km^2 with a minimum volume estimate of 138 km^3 (DRE). The 10.3 Ma episode generated another elliptical caldera (19 $\times$14 km), with the same orientation as the previous one, from which intracaldera and outflow ignimbrites covered a total area of about 1,700 km^2, representing a minimum eruption volume of 341 km^3 (DRE).

In this work we discuss the significance of the Cerro Aguas Calientes caldera in comparison with other well known examples from the central Andes in terms of tectonic setting, eruption mechanisms, and volumes of related ignimbrites. We suggest that our kinematic model is a common volcano-tectonic scenario during the Cenozoic in the Puna and Altiplano, which may be applied to explain the origin of other large calderas in the same region.