Melt inclusion study from the Quaternary Pudahuel Ignimbrite: a window to magma chamber processes

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Pudahuel ignimbrite is the result of a caldera forming eruption, associated with the Maipo Volcanic Complex in the Andean Southern Volcanic Zone. It is a rhyolitic, quaternary deposit, whose erupted volume has been estimated to be 450 km^3 of pumice and ash. Evidence of this large eruption can be found in Chile and Argentina, along three main valleys and some of the pyroclastic deposits even crop out in the larger area of Santiago de Chile. We use melt inclusions to study the source of the magma processes leading up to the eruption.

Samples from the plinian fall and pyroclastic flow phases were collected from different outcrops in Chile and Argentina. Petrography and geochemistry of these samples is uniformly rhyolitic, with little variability in textures and mineralogy. Plagioclase is the most abundant (~1.6%) mineral. The other mineral phases, in order of abundance are biotite, Fe-Ti oxides, zircon and apatite.

Plagioclase is present in the samples as phenocryst, and its size varies from 0.5 mm to 1.5 cm. Two plagioclase families were identified: 1) generally anhedral and normally zoned (An_{40-17}) and 2) anhedral to subhedral and unzoned (An_{17}); both families have melt inclusions, which were chosen for analytical work on volatiles and melt chemistry.

Three melt inclusions assemblages (MIAs) have been identified: MIA1, of trapezoidal inclusions, completely homogenised; MIA2, of rounded ellipsoidal inclusions, with a single bubble; and MIA 3, of rounded ellipsoidal inclusions with more than one bubble. These MIA are identified in both plagioclase families. Their size varies between 30 and 10 um, and the ones > 25 um were selected for volatile content analyses by SIMS. Preliminary results suggest that there is a slight variation in the composition and volatile content of magmas along the eruptive event. Our results open a new perspective about the different mechanisms involved in this catastrophic plinian eruption.