

Insights into Copahue volcanism (Chile/Argentina border): a melt inclusions approach

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Copahue volcano is an active stratovolcano in the Andean Southern Volcanic Zone (SVZ), straddling at the border between Central Chile and Argentina. The volcano's eruptive style has changed from effusive in the Pleistocene to explosive in the Holocene. The prehistoric eruptions can be divided into preglacial (PG), synglacial (SG) and postglacial (PM). In order to investigate the evolution of the magma source through time, we have focused our study on the eruptive products from SG to 2014 eruption (SUM2014). Sampled rocks are glomeroporphyritic, with feldspars, ortho and clinopyroxene, and olivine in order of abundance. Feldspar composition varies from andesine (SG) to labradorite (SUM2014). Two pyroxene types are present in SG and PM samples (augite and enstatite), while SUM2014 presents augite, pigeonite and enstatite. Thermobarometric estimation shows a bimodal distribution for SG and SUM2014 ($P=10-12$ kbars and $5-8$ kbars) and only one interval for PM ($P=7-8$ kbars). Melt Inclusions Assemblages (MIAs) are found in all mineral phases, mostly recrystallized, with one or more bubbles and daughter oxide minerals. Compositions vary from trachyandesitic to dacitic for SG, andesitic to trachydacitic for PM, and basaltic andesitic to trachydacitic for SUM2014. Major element systematics show the existence of a bimodal distribution of pyroxene and feldspar hosted MIA in SUM2014, which together with the co-presence of pigeonite and augite and the bimodal distribution of P, can be interpreted as evidence of mixing of two types of magmas, evolving at different depths. Trace element systematics for MIA in SG, PM and SUM2014 show a negative anomaly for Nb and Ti and a positive one for Pb, characteristic of rocks produced by arc basaltic volcanism. The Ba/Th vs La/Sm systematics show a dual influence of fluid release and partial melts of subducted sediments for SUM2014, while less H₂O fluxing is accounted for the source of both SG and PM.