

V23D-0243 - Exploring the Role of Mafic Magmas and Their Volatile Content During the 2011-12 Puyehue-Cordon Caulle Eruption



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13:40 - 18:00

Moscone South - Poster Hall

Abstract

Puyehue-Cordon Caulle (PCC) is a rhyodacitic volcanic complex in the Southern Andes (40.5°S, 72.2°W) that produced three rhyolitic eruptions with nearly the same chemical compositions and erupted volumes of 0.1-0.6 km³ in the last hundred years with the most recent a VEI 4 eruption in 2011-12. The eruption was accompanied with significant episodes of uplift and deformation that indicates shallow magma storage. It has been suggested that crystal mush storage processes have fed the 2011-12 eruption. Potential evidence of the mush may exist in the presence of mafic enclaves in the effusive rhyolite. Whether these enclaves represent mafic recharge and trigger to the eruption or entrained crystalline mush from which rhyolitic melt was extracted has yet to be determined conclusively. To understand the role that mafic enclaves have within the system, we present new petrologic constraints on their storage conditions and their compositional links to the erupted rhyolites. The mafic enclaves span a wide range in composition (5.2 – 9.3 wt.% MgO), while the matrix glass in the mafic enclaves is almost identical to the felsic glass in the rhyolite. It has been proposed that PCC experiences crystal mush storage where the mafic enclaves could represent the crystal-rich portion and the rhyolite lava as the melt lens cap. We present mass balance calculations to test the relationship between the mafic enclaves and the rhyolite. This will provide better understanding of PCC's reservoir architecture and evolution.

While PCC's three historic eruptions are similar in composition, its spatially disperse construction could be a result of polybaric reservoirs. Analyzing the mafic enclaves' petrology as well as the system's volatile budget will help determine whether magmas -including mafic compositions that feed the felsic reservoir- were stored exclusively in the uppermost crust or whether storage extended to deeper regions of the crust. These datasets will provide important constraints for additional work on the volatile budget of PCC and the role that volatiles play in our understanding of the eruption processes. Utilizing both the volatile budget and information from the mafic enclaves combined with deformation data and physics-based models will allow us to gain new insight on the eruption trigger and the frequency and style of eruption.

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