Introducing and Geologic Setting

- Flare-up magmatism is characterized by continuous bulk rock compositions resulting from progressive homogenization. The Altiplano-Puna Volcanic Complex (APVC) of the Central Andes is a great example of this (de Silva et al., 2006).

- Most of the ignimbrites in the APVC are large-volume deposits with only a minor component of non-ductile compositions. These were thermally sustained and recharged by a mid-oceanic ridge crust known as the Altiplano-Puna Magmatic Body (APMB; de Silva, 1986).

- The occurrence of two distinct rhyolite flows in the ignimbrite is of great interest for the development of compositional gaps and may illuminate the processes occurring in large systems.

- A generalized map showing the distribution of the Capulli Ignimbrite at the edge of the APVC. The stratigraphic section below demonstrated points with arrows. The water contents are shown in the adjacent map below (adapted from Smith et al., 2010).

Questions that drive this study:
1. The mechanism responsible for creating the compositional gap
2. The unique phase assemblages
3. The compositional heterogeneity

Flare-up magmatism is characterized by monotonous bulk rock compositions resulting from progressive homogenization. The Altiplano-Puna Volcanic Complex (APVC) of the Central Andes is a great example of this (de Silva et al., 2006).

- Major and trace elements of glomerocrysts in the andesite are consistent with simple lever principle that drives andesitic bulk rock to the corresponding magmatic rock and phase 2 rhyolite. The Phase 1 rhyolite is not on trend with andesite and Phase 2 rhyolite. Phase 2 rhyolite bulk rock and glass compositions are in agreement with high FeO and FeOt that is responsible for fayalite stability (Wark et al., 1992, 1994).

- Rhyolite and Phase 2 rhyolite have nearly invariant compositional phase. Phase 1 rhyolite is less radiogenic and does not represent assembled basaltic melt (based on FeO variation)

- The andesite and Phase 2 rhyolite are nearly perfectly fractionated from one another. Magmatic Chamber Simulator models (Bahim et al., 2003) model this well and reproduce the crystallization sequence. The best fractionation model for APVC (N1 and N2) is 3.4 and H2O in the andesite.

- With increasing differentiation and water content increases, FeO/FeOt variation changes due to crystalization and the dominant oxide, as tracked by plagioeze FeOt content. This results in a water rich, high FeOt rhyolite.

- The Phase 1 rhyolite has geochemistry typical of APVC magma. Incongruent dynamic melting (IDM) models (Bus and Reid 2001) were used to model the Phase 1 composition as a recycled granodiorite from an earlier phase of the flare-up.

Results

- Phase 2 Phenocrysts: Two populations: 1. High An overlapping with andesite. 2. Low An with two subpopulations. Opx is light shaded in FeOt.

- Phase 1 Phenocrysts: Very light An distribution. Peculiar clinopyroxene

- Grt Hip: Light distributions and low FeOt. Grt HIP and FeOt is offset relative to grt Hip.

- Anfibole Phenocrysts: Normal distributions and light shaded FeOt.

- Opx: Two populations of phenocrysts. First is high MgOt and is in correlation with FOOt. Second is lower MgOt and has no correlation with FOOt. Rms converges towards Gd polymorphs.

- PTX: Note the water contents are typical of arc magmas with FOOt. Temperature of Phase 2 rhyolite shows high fluid content.

Modelling and Conclusions

Conclusions:
1) In situ crystallization + fractionation, followed by melt extraction facilitated the compositional gap
2) The unique phase assemblage is facilitated by low (FeOt) and high H2O. Partition the result of the petrologic environment and distribution of H2O and NaOt in the mineral that increased FeOt.
3) Intergranular growth of the intermediate and low FeOt assemblages is preserved due to the low H2O system (de Silva and Ward, 1992).
4) Intergranular between the frameworks and low FeOt assemblages is preserved due to the low H2O system (de Silva and Ward, 1992).
5) The crystal poor nature of the extracted rhyolite that did not need thorough pro-eutectic homogenization (Dutka and Bachmann, 2010; Nuter et al., 2012).

- Composite magmas are a candidate for the low FeOt rhyolite.

- High FeOt rhyolite is a candidate for the high FeOt rhyolite.

- The low FeOt rhyolite is a candidate for the andesite.

- The high FeOt rhyolite is a candidate for the high FeOt rhyolite.

- The low FeOt rhyolite is a candidate for the andesite.

- The high FeOt rhyolite is a candidate for the high FeOt rhyolite.

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