Erupted cumulate fragments in rhyolites from Lipari (Aeolian Islands)

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Over the last ~ 267 ky, the island of Lipari has erupted magmas with a range of compositions from basaltic andesites to rhyolites, with a notable compositional gap in the dacite field [1]. Bulk geochemical and isotopic compositions of the volcanic succession, in conjunction with major and trace elemental compositions of minerals, indicate that the rhyolites were dominantly generated via crystal fractionation processes, with subordinate assimilation. Radiogenic (Sr, Nd, and Pb) and stable (O) isotopes independently suggest ≤30% of crustal contamination with the majority of it occurring relatively deep in the system (in mafic compositions). Within the rhyolites, crystal-rich, K_2O-rich enclaves are commonly found. In contrast to previous interpretations [2] [3], we suggest these enclaves represent partial remobilization and eruption of cumulate fragments discarded during rhyolite formation. Cumulate remobilization is supported by the presence of (1) resorbed, low-temperature minerals (biotite and sanidine), providing the potassic signature to these clasts, (2) reacted Fo-rich olivine, marking the presence of mafic recharge, (3) An_{48-23} plagioclase, filling the gap in feldspar composition between the andesites and the rhyolites and (4) strong enrichment in Sr and Ba in plagioclase and sanidine, suggesting crystallization from a locally enriched melt. Based on Sr-melt partitioning, the high-Sr plagioclase would require ~ 2300 ppm Sr in the melt, a value far in excess of Sr contents in Lipari and Vulcano magmas (50-1532 ppm) but consistent with melting of a feldspar-rich cumulate. Due to the presence of similar crystal-rich enclaves within the rhyolites from Vulcano, we propose that the involvement of cumulates in petrogenesis of high-SiO_2 rhyolites, may be a common process at the Aeolian volcanoes, as already attested for a variety of volcanic systems around the world.

[1] Forni, Lucchi, Peccerillo, Tranne, Rossi, Frezzotti (2013) *Geol Soc Mem* **37**, 213-279. [2] Gioncada, Mazzuoli, Bisson, Pareschi (2003) *J Volcanol Geotherm Res* **122**, 191-220. [3] Davì, De Rosa, Holtz (2010) *Bull Volcanol* **72**, 991-1008.