EGU2020-13633
https://doi.org/10.5194/egusphere-egu2020-13633
EGU General Assembly 2020

The role of contamination in the tightrope of Gran Canaria felsic magma differentiation

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Peralkaline magmatism is mostly sustained by extensive feldspar fractionation from mafic parents at shallow depths in intraplate settings. In this case, silica saturation is critical as it controls the differentiation trend that a peralkaline magma follows. SiO_2-oversaturated parents fractionate towards rhyolites, and SiO_2-undersaturated towards phonolitic compositions. The Miocene post-shield stage of Gran Canaria records both differentiation trends, which has previously been ascribed to changes in the mantle source. Such stage has been divided in the Mogan and Fataga Group based on silica saturation. Here, we propose that contamination plays a key role in the differentiation of Gran Canaria volcanics. This assumption is supported with new $^{40}Ar/^{39}Ar$ geochronology, mineral, glass and juvenile clast chemistry (oxygen isotopes, major and trace elements) merged with a detailed stratigraphy. Two types of contaminants were identified, one being cogenetic feldspar-dominated cumulates and the second one being sediments within the island crust. We propose that barium-rich trachytic magmas with positive europium anomalies are linked to melting of the feldspar cumulates left after extensive fractional crystallisation. The chemistry of such trachytes does not follow a liquid line of descent and contains reverse-zoned alkali-feldspars. The shift in silica saturation took less than 1 Ma and is marked by an increase in peralkalinity from 0.9 to 1.5 and a decrease in oxygen isotopes ratio from 7.0 to 5.0 ‰. We interpret these observations as the consequence of maturation of the shallow magma reservoir towards less sediment contamination. Such assimilation of sediments is limited thermally, and compositionally because the system should remain alumina deficient. Crustal assimilation in Gran Canaria did not produce voluminous silicic melts by itself but allowed the deviation of the differentiation trend of a more primitive, initially SiO_2-undersaturated magma. The tightrope of differentiation is represented by the thermal divide between the granite and phonolite minima (i.e. feldspar join in petrogeny's residua system). Contamination by sediments produces a transient SiO_2-oversaturated system (Mogan Group). Cogenetic assimilation of cumulates by thermal rejuvenation of the reservoir attracts the magma towards the thermal divide (ubiquitous during the peralkaline stage). Armouring against sediment assimilation through time relaxes the system back to the initial SiO_2-undersaturated conditions (Fataga Group).