



## **Magma chamber recharge in Corvo volcanic island (Açores, Portugal)**

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The Corvo Island is located in the Açores archipelago (Portugal). It is situated within the American Plate, to the west of the Mid-Atlantic Ridge. Two main volcanic complexes are recognized in Corvo: a) The Basal Complex, the oldest and associated with the proto-island volcanism, which includes surtseyan tuffs and basalts and b) The Upper Complex resulting from subaerial volcanic activity and divided into three volcanic units. The first (0.71 Ma) and second (0.43 Ma) units consist of lava flow&ndash;pyroclastic successions; the latter comprises the caldera formation units characterized by pumice, surges and pyroclastic flows indicating a plinian to sub-plinian volcanism type. The third (0.10 Ma) unit is characterized by strombolian, phreatomagmatic and pyroclastic deposits.

We have studied the lavas from the four volcanic stages. Their compositions range from picrobasalts to benmoreites of alkaline affinity. Their principal mineral assemblage is composed of Ol, Cpx, Pl and accessory Amp and opaque minerals. The normalized REE patterns of the studied lavas present rather parallel LREE-enriched trends with La/LuN: 11.2-20.9 values. Therefore, they may be related by fractional crystallization. In order to verify this hypothesis, we have developed a REE-fractionation model; the most primitive analyzed lava (SiO<sub>2</sub>: 45.40%; MgO: 15.41%; Cr: 1250 ppm; Ni: 298 ppm) has been used as the parental magma, as it probably represents the closest composition to the primary magma.

Fractionating Ol (30%), Cpx (60%) and Pl (10%), we can model all studied lavas of Corvo Island, although the best fit is achieved by including accessory Amp and opaque minerals in the calculations. However, two different fractional crystallization stages can be recognized.

The first fractional crystallization stage ranges from 0 to 70% crystallization of parental magma and produces the Basal Complex lavas and the first unit of the Upper Complex lavas (50 to 70% of crystallization is needed to produce this unit). Therefore, Basal

Complex lavas and the first Unit of the Upper Complex lavas can be grouped in a single fractional crystallization process. The second fractional crystallization stage produces the second and third units of the Upper Complex lavas. Again, 0% to 70% crystallization of parental magma is needed to produce the youngest lavas of the island.

The fact that the second fractional crystallization stage begins with melts as primitive as the ones from the Basal Complex, requires a primitive magma recharge prior to the second fractional crystallization stage. Hence it is clear that during the formation of Corvo Island the

magmatic chamber suffered a magma recharge by a primitive magma, which allowed the repetition of the fractional crystallization process with similar fractionation conditions (percent crystallization and minerals) generating the youngest lavas of the Upper Complex.