The Graciosa Island belongs to the Central Group of the Azores archipelago, to the east of the Mid-Atlantic Ridge. Three main volcanic complexes are recognized, in order of decreasing age: the Serra das Fontes Volcanic Complex (620±120 Ky) composed of basaltic effusive products, the Serra Branca Volcanic Complex (350±40 Ky) which presents trachytic products and the Vitória-Vulcão Central Volcanic Complex (without available radiometric ages) formed by basaltic to trachytic terms and divided into two contemporaneous units: Vitória and Vulcão Central.

A selection of seventeen lavas from the three volcanic complexes and six gabbroic xenoliths sampled from a Vulcão Central Unit lava flow has been studied. The studied xenoliths present rather parallel alkaline primitive mantle-normalized REE patterns. The studied lavas display alkaline REE patterns in agreement with those of the xenoliths. Due to the cumulate origin of these xenoliths and their similar composition to the lavas, they probably formed by fractional crystallization of the same magma. In order to demonstrate this hypothesis, we have developed a major element model using the MELTS software; the most primitive analyzed lava (SiO2: 47.81%; MgO: 10.58%; Cr: 550 ppm; Ni: 200 ppm) has been used as the closest composition to the primary magma. The major composition of the alkaline lavas and xenoliths can be modeled by fractional crystallization at a pressure of 5 Kbar. Hence, it is clear that both xenoliths and lavas in Graciosa share a common magma source, being the lavas the remaining liquids of the crystallization of the xenoliths as cumulates of the magma chamber, located about 15 km depth.