Abstract

The island of Capraia, Italy, is the only stratovolcano of the Tuscan Magmatic Province and is composed of ultra-potassic to shoshonitic calcalkaline rocks. This study focuses on the first volcanic cycle dated between ~7.8 and ~7.1Ma (Gagnevin et al., 2011, Gasparon et al., 2009) which is composed mainly of andesite and few dacites. Petrological observations, major and trace elements have been performed on each unit of the cycle with additional isotopic data. Electron microprobe analyses have been performed on plagioclases and pyroxenes of three units. The geochemistry data suggest three different evolution patterns for three different groups of units, however all these groups suffered mafic recharge from the parental magma . Recharge which is visible from field and petrological observations, as enclaves are present and phenocrysts present in the rocks are reacted.

Initial isotopic ratios show that the first volcanic cycle of Capraia has a source similar to the shoshonites, which comes from a metasomatised mantle hosting phlogopite and clinopyroxene veins(Menetrey, 2018).

Monte Carlo simulation have been calculated for two different evolution patterns: pure "closed system" fractional crystallisation (FC) and "open system" fractional crystallisation with assimilation(AFC), where the assimilant is the mean composition of the analysed enclaves. Both models are based on Rare Earth Elements fractionation only from a parental magma with a shoshonitic composition. The results of these simulations show that amphibole is the dominant phase fractionating at depth, either for the FC or AFC, with additional olivine, clinopyroxene and orthopyroxene. The presence of plagioclase in all the units , added with low or no Sr depletion indicates that this phase does not fractionate or fractionates in very few quantites for the most evolved units.

Microprobe data on plagioclase and clinopyroxene show that these two phases co-crystallise. Moreover, core to rim profiles in plagioclase display peaks in anorthite content sometimes linked to increasing Fe content, which supports the mafic recharge hypothesis. The anorthite content in the plagioclase coupled to the software rhyolite-MELTS calculations, allows us to find a range of temperatures and pressures prior to eruption for the three unit analyzed (ILP, OCO and IPO).

The P-T conditions thus obtained are storage at around 3Kbars (~12Km) and temperatures going from 900◦C to <750◦C in the magmatic chambers, coming from a same parental magma emplaced at the MOHO (~23Km (Dini et al., 2005))