# Abstract

The subduction of plates and their topographic asperities have been proposed to have a profound impact on the tectonic stresses of the overriding plate as well as on the geochemical signature of the ascending magmas. In Ecuador, Chiaradia et al., (2019) suggested that the latitudinal geochemical variations observed are induced by the collision and subduction of the Carnegie ridge. To test this hypothesis, we made petrographic observations on over 120 rock samples of 19 Quaternary volcanoes located along the frontal arc between latitudes 1ºN and 1ºS. We discuss mineral quantification (modal analyses), mineral texture and reaction rims, and chemical analyses of amphibole and plagioclases performed in some of these samples. The petrographic outcomes are a latitudinal increase in abundance of plagioclase and decrease of amphibole in the fractionating assemblage of volcanoes situated farther away from the equator. Evolved felsic magmatic minerals like biotite and quartz (with clinopyroxene corona) were observed to occur with primitive magmatic olivine xenocrysts in northern/southern volcanoes. Additionally, thermobarometric calculations on samples composed by calcic-amphiboles were done using the equations of Ridolfi et al., (2010) and Putirka, (2016). Higher pressure ($\pm$ temperature) and higher oxidation states of the magma were obtained for the central equatorial volcanoes.

A deeper magmatic evolution for the central volcanoes is suggested first by the highest maximal pressures and oxidation state, and second by the highest minimum anorthite content in plagioclases, as well as the highest amphibole modal contents. The presence of olivine only in the northernmost and southernmost volcanoes and fractionating with plagioclase is consistent with a shallower depth of evolution of primitive magmas at northern/southern latitudes. The ascent through multiple storage regions to lower crustal levels with evolution to felsic compositions is proposed by the polybaric amphibole record, lower modal amount of amphibole and pyroxene and higher of plagioclase, and the fractionation of low pressure quartz and biotite minerals. A magmatic evolution by AFC and mixing is suggested by the occurrence of mingling textures in the groundmass, the observation of destabilization textures on minerals and the presence of minerals having fractionated from magmas with different degrees of evolution.

The petrographic and mineralogical model of this study is consistent with the hypothesis of Chiaradia et al., (2019) of a change of the depth of evolution of the magmas to mid-crustal levels for the central volcanoes and to lower-crustal levels for the southern/northern volcanoes, proposed to be linked to the compressional stress induced in the crust of the overriding plate by the collision of the aseismic Carnegie ridge at the equator.

**Keywords:** Igneous petrography; frontal arc; Ecuador; fractional crystallization; amphibole thermobarometry; AFC-mixing processes; Carnegie ridge; quaternary.