

New groundmass K-Ar ages of Iliniza Volcano, Ecuador

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Previous studies demonstrated the existence of a marked temporal geochemical variation of several long-lived volcanoes of the Ecuadorian arc (e.g. Cayambe, Mojanda-Fuya Fuya, Pichincha, Atacazo-Ninahuilca), that includes an evolution from typical calc-alkaline arc magmas present at the older edifices to adakite-like compositions in the younger edifices. Two non-exclusive models have been proposed to explain such a systematic evolution, including a progressive change of the nature of the subduction component, and/or a change in the modalities of the magmatic differentiation in the crust. The purpose of this study is to constrain the temporal evolution of Iliniza volcano, an eruptive center located in the volcanic front of the Ecuadorian arc and that also shows these geochemical signature. Iliniza is a twin-peaked composed volcano, comprising two main edifices: North and South Iliniza, and two satellite domes: Pilongo and Tishigcuchi. The whole volcano is located closely to the west of the eroded Santa Cruz volcano, partially covering its western flank. On the basis of the previous work of Hidalgo et al. (2007), we collected several rock samples from Santa Cruz volcano and the main geological units of Iliniza volcano for petrology, geochemistry and dating using the K-Ar Cassinot-Gillot technique performed on groundmass. The preliminary ages obtained show that Santa Cruz volcano was active at about 700 ka, which represents an older bound for Iliniza volcano. The older age from Iliniza volcano corresponds to Pilongo dome, which is located on its northern flank and yields an age around 350 ka. Stratigraphic relationships suggesting that Iliniza began its construction with the North Iliniza edifice are supported by our dating results, which indicate an age around 125 ka. For South Iliniza edifice, we obtained ages between 50 and 25 ka, this suggests that construction of the North Iliniza edifice should have finished earlier than 50 ka. The last phase of Iliniza eruptive activity corresponds to the Tishigcuchi dome emplaced over the southern flank of South Iliniza. Since the F-rhyolite series fallout deposits from Cotopaxi volcano (13-5.9 ka; Hall and Mothes, 2008) cover the entire volcano, Tishigcuchi's activity must have occurred before 13 ka. Based on morphology, it is even possible that the activity of South Iliniza edifice could have been extended until this last date. Coupling these new ages with the geochemical data we found that the geochemical change occurred in Iliniza volcano almost at the same time period compared to other long-lived volcanic centers. Finally, the numerical reconstructions of Iliniza's main morphologies allowed the calculation of their construction and quiescent erosion rates providing a detailed view of this volcano and enable comparison with other volcanic centers from Ecuadorian Arc.

Hall, M., & Mothes, P. (2008). *The rhyolitic-andesitic eruptive history of Cotopaxi volcano, Ecuador. Bulletin of Volcanology*, 70(6), 675-702.

Hidalgo, S., Monzier, M., Martin, H., ... & Cotten, J. (2007). *Adakitic magmas in the Ecuadorian volcanic front: petrogenesis of the Iliniza volcanic complex (Ecuador). Journal of Volcanology and Geothermal Research*, 159(4), 366-392.