



## Pre-eruptive physical conditions of El Reventador volcano (Ecuador) inferred from the petrology of the 2002 and 2004–05 eruptions

Pablo Samaniego <sup>a,b</sup>, Jean-Philippe Eissen <sup>b</sup>, Jean-Luc Le Pennec <sup>b</sup>, Claude Robin <sup>a,b</sup>, Minard L. Hall <sup>a</sup>, Patricia Mothes <sup>a</sup>, Deborah Chavrit <sup>b</sup>, Joseph Cotten <sup>c</sup>

<sup>a</sup> Instituto Geofísico, Escuela Politécnica Nacional, Ap. 17-01-2759, Quito, Ecuador

<sup>b</sup> IRD, UMR 163, Laboratoire Magmas et Volcans, 5 rue Kessler, 63038 Clermont-Ferrand, France

<sup>c</sup> Université de Bretagne Occidentale, CNRS-UMR 6538, 6 avenue Le Gorgeu, BP 809, 29283 Brest, France

### Abstract

A petrological study of the eruptive products of El Reventador allowed us to infer the magmatic processes related to the 2002 and 2004–05 eruptions of this andesitic stratovolcano. On November 3, 2002, El Reventador experienced a highly explosive event, which was followed by emplacement of two lava flows in November–December 2002. Silica contents range from 62 to 58 wt.% SiO<sub>2</sub> for the November 3 pyroclastic deposits to 58–56 and 54–53 wt.% SiO<sub>2</sub> for the successive lava flows. In November 2004 eruptive activity resumed supplying four new lava flows (56–54 wt.% SiO<sub>2</sub>) between November 2004 and August 2005.

Volatile contents in matrix glasses and glass inclusions from the November 3 pyroclastic deposits allow us to estimate the total amount of SO<sub>2</sub> and HCl released into the atmosphere during the paroxysmal phase (i.e. 80 kT of SO<sub>2</sub> and 280 kT of HCl). Pre-eruptive pressure-temperature conditions of the magmas range from 300 to 150 MPa and ~1000 °C with high water contents (~5 wt.%). We propose the existence of an andesitic magma body located at ~7–12 km depth that is frequently intruded by more primitive, hydrous magmas from a deeper source. The initial crystallization of amphibole from the hydrous primitive magma seems typical of El Reventador, as well as the historically recurrent and regular periods of eruptive activity lasting several years. This eruptive behaviour coupled with the fractionation and mixing processes inferred from the 2002 and 2004–05 petrologic data suggest that deep magmatic recharge at El Reventador is frequent, and is probably responsible for the high frequency of eruptions.

### Available in:

*Journal of Volcanology and Geothermal Research*, 2008, vol. 176, no 1, p. 82-93.

DOI: <https://doi.org/10.1016/j.volgeores.2008.03.004>

<http://www.sciencedirect.com/science/article/pii/S0377027308001005>