



The zone 1440 AD eruption of the soufriere of Guadeloupe (Lesser Antilles) : an experimental determination of the pre-eruptive consitions of the andesitic magma body.

Stéphane Poussineau, Michel Pichavant, Jean-Louis Bourdier

► To cite this version:

Stéphane Poussineau, Michel Pichavant, Jean-Louis Bourdier. The zone 1440 AD eruption of the soufriere of Guadeloupe (Lesser Antilles) : an experimental determination of the pre-eruptive consitions of the andesitic magma body.. Geophysical Research Abstracts, 2004, Nice, France. hal-00078539

HAL Id: hal-00078539

<https://insu.hal.science/hal-00078539>

Submitted on 14 Jun 2006

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



THE ZONED 1440 AD ERUPTION OF THE SOUFRIERE OF GUADELOUPE (LESSER ANTILLES): AN EXPERIMENTAL DETERMINATION OF THE PRE-ERUPTIVE CONDITIONS OF THE ANDESITIC MAGMA BODY

S. Poussineau (1), M. Pichavant (1) and J.L. Bourdier (1)

(1) Institut des Sciences de la Terre d'Orléans, UMR 6113 du CNRS
(stephane.poussineau@univ-orleans.fr/fax:+33 02 38 63 64 88)

The 1440 AD eruption of the Soufriere of Guadeloupe (Lesser Antilles arc) is characterized by a dramatic change of the chemical composition of erupted products, from andesitic (clear pumices, 61-62 wt% SiO₂) to basaltic andesite (dark scoria, 55-56 wt% SiO₂). This compositional sequence is interpreted to reflect the tapping of a silicic magma body remobilised following the arrival of a mafic magma batch. The conditions of equilibrium (T, P, fO₂, melt H₂O content) within the andesite body prior to the mixing event were determined from a coupled mineralogical/petrological and experimental approach.

The andesitic pumices comprise plagioclase, orthopyroxene, clinopyroxene, magnetite and rare ilmenite phenocrysts. Plagioclase shows complex oscillatory zoning (An₅₅₋₇₅), with rim compositions close to An₆₅. Orthopyroxene (En₅₅₋₆₀) and magnetite (Mt₆₅₋₇₀) are weakly zoned. Glass inclusions trapped in plagioclase and orthopyroxene are rhyolitic (72 wt% SiO₂). They show small variations in water contents from 4.5 to 5.5 wt%, as determined with the by-difference technique and from near-infrared spectroscopy. Pairs of coexisting Fe-Ti oxides yield equilibrium temperatures ranging between 800°C and 950°C for DNNO values between +0.4 and +1 (calculations at 2 kbar).

A sample representative of the andesitic body (61 wt% SiO₂) was selected for the experiments. All were performed in an internally heated pressure vessel equipped with a fast quench apparatus, at T between 800 and 950°C, P between 1 and 2 kbars,

f_{O_2} from DNNO-1 to DNNO+2, and for both water saturated and undersaturated conditions, using H₂O-CO₂ mixtures. Comparison between experimental and natural phase assemblage and chemical compositions allows the equilibrium conditions of the andesitic body to be specified, i.e. 875-900°C, 1.5 \pm 0.25 kbar, DNNO = +0.5 to +1 and melt H₂O content between 4.5 to 5 wt%.