Geophysical Research Abstracts, Vol. 8, 09147, 2006
SRef-ID: 1607-7962/gra/EGU06-A-09147

0.1 Melt inclusion record of the conditions of ascent, degassing and extrusion of volatile-rich alkali basalt during the powerful 2002 flank eruption of Mount Etna (Italy)

N. Spilliaert (1), P. Allard (1,2), **N. Métrich** (1) and A.V. Sobolev (3)

(1) Laboratoire Pierre Süe, CNRS-CEA, Saclay, France ; (2) Istituto Nazionale di Geofisica e Vulcanologia (INGV), Catania, Italy; (3) Max-Planck-Institut f. Chemie, Mainz, Germany. nicole.metrich@cea.fr

Two unusual, highly explosive flank eruptions succeeded on Mount Etna in July-August 2001 and in October 2002 - January 2003, raising the possibility of changing magmatic conditions. Here we decipher the origin and mechanisms of the second eruption from the composition and volatile (H_2O, CO_2, S, Cl) content of olivine-hosted melt inclusions in explosive products from its south flank vents. Our results demonstrate that powerful lava fountains and ash columns at the eruption onset were sustained by closed system ascent of a batch of primitive, volatile-rich ($\geq$4 wt %) basaltic magma that rose from $\geq$10 km depth b.s.l. and suddenly extruded through 2001 fractures maintained opened by eastward flank spreading. This magma - the most primitive for 240 years - probably represents the alkali-rich parental end-member responsible for Etna lavas' evolution since the early 1970s. Few of it was directly extruded at the eruption onset, but its input likely pressurised the shallow plumbing system several weeks before the eruption. This latter was subsequently fed by the extrusion and degassing of larger amounts of the same, but slightly more evolved, magma that were ponding at 6-4 km b.s.l., in agreement with seismic data We find that, while ponding, this magma was flushed and dehydrated by a CO_2-rich gas phase of deeper derivation, a process that may commonly affect the plumbing system of Etna. This is an important and relatively new observation that may apply to other alkali basaltic volcanoes fed by CO_2-rich magmas. Finally, the volatile budget of the eruption, computed from the volumes of erupted magma and the amount of dissolved volatiles, shows no excess sulphur degassing. This implies no pre-eruptive SO_2 accumulation and a prevalently closed system bulk degassing process. We show indeed that sulphur exsolution from Etna basalt becomes significant at only low pressure $\leq$150 MPa., that is when magma reaches the shallow plumbing system. This information places important constraints on the interpretation of the variations of both the SO_2 flux and S/Cl ratio measured in Etna gas emissions.