Petrological and textural constraints on explosive activity of the last 2ka of Turrialba volcano (Costa Rica)

A. DI PIAZZA[1*], C. ROMANO[1], G. DE ASTIS[2], A. VONA[1] AND G.J. SOTO[3]

[1]Dip. di Scienze, Univ. Roma Tre, Italy (andrea.dipiazza@uniroma3.it)(*presenting author)
[2]Istituto Nazionale di Geofisica e Vulcanologia Roma-1, Italy
[3]Instituto Costarricense Electricidad, San Josè, Costa Rica

We present here a throughout investigation of the last 2ka volcanic activity of the Turrialba volcano (Costa Rica), which shows signs of potential reawakening since 2006. In particular we choose two magmatic end members: a basaltic and an andesitic eruption. Mineral assemblage is composed by abundant plagioclase (An_{30} – An_{72}), clino- and orthopyroxenes, and olivine crystals (Fo69 – Fo80). We studied the stratigraphy of proxymal, intermediate and distal outcrops of the two eruptions. We calculated the parameters describing the vesicles spatial arrangement of our samples (i.e. the size, shape and number), as it records the conditions of ascent and degassing which determined the different explosivity of these eruptions. The andesitic samples were classified in two classes, differing in density and porosity: pumices (0.6 – 1.2 g/cm^3; porosity 79-61%) and scoriae-like clasts (1.5 - 1.7 g/cm^3; porosity 54-32%). Samples show maximum dimension of vesicles between 0.6 and 0.3 mm. The Vesicle Number Density is in the range 2.28–6.60 x 10^8 cm^{-3}, values comparable to those related to Plinian eruptions (e.g. Vesuvius 79 A.D.: 10^8 - 10^9 cm^{-3}). The basaltic magma feeding the last observed eruption at Turrialba, generates highly porphyritic scoriae and bombs, with a final stage made of breadcrust bombs. Vesicle dimensions range between 0.30 – 2.37 mm. VND values range between 9.74 x 10^5 cm^{-3} and 3.9 x 10^6 cm^{-3} (values similar to Stromboli volcano or Hawaian volcanoes activity). We can classify the 1864-66 A.D. activity as a powerful Strombolian eruption. This study highlights a wide spectrum of degassing processes which occurred at Turrialba volcano in the last 2ka, providing new insights into the eruptive behavior of this volcano.

Short crystal history in the recent magmatic system of Santorini volcano, Greece: inferences from micro-Sr isotope data

SARA DI SALVO [1], LORELLA FRANCALANCI [1], TIM H. DRUITT [2] AND ELEONORA BRASCHI [3]

[1] Dipartimento di Scienze della Terra, Universita' degli Studi di Firenze, via la Pira, 4, Firenze, Italy.
[2] Clermont Université, Université Blaise Pascal, Laboratoire Magmas et Volcans, Clermont-Ferrand, France.
[3] CNR-IGG, Sezione di Firenze, via La Pira, 4, Firenze, Italy.

Magma mineral phases retain the history of changing physical and chemical conditions during their growth due to the frequent occurring of mineral/liquid elemental and isotopic disequilibria. In many volcanic systems, indeed, bulk rock compositions often represent a mechanical mixture of various phases with possible different origin. Accordingly, analyses of $^{87}Sr/^{86}Sr$ on core-rim traverses of minerals give us the chance to understand the dynamics and timescales of magmatic processes during the ascent of magma to the surface. Micro-Sr isotope analyses, by microdrilling, have been used, therefore, for better understanding the volcanic system of the last 3.6 ka of Santorini history, from the huge explosive event of the Minoan eruption to the successive Kameni activity. The latter originated the Palea- and Nea-Kameni islets, inside the Minoan caldera, through nine mainly effusive subaerial events, from A.D. 46-47 to 1950. The erupted products are dacitic lavas including basaltic to andesitic enclaves, with Sr isotopes increasing with time in both enclaves and host lavas.

We focussed our micro-analytical study on the plagioclase crystals of the rhyodacitic pumices from the Minoan eruption and of the oldest and youngest post-caldera dacitic lavas. Different types of plagioclase have been identified based on textures and zoning patterns. Anorthite content overall varies between 35-90% in both systems. Contrarily to many other volcanic systems, $^{87}Sr/^{86}Sr$ values of plagioclase do not largely change within the single eruptive event and generally reflect the respective whole-rock values, except for some xenocrysts in Kameni lavas coming from the mafic enclaves. The different crystal types of the Minoan pumices have similar $^{87}Sr/^{86}Sr$ values, which are higher than those of the Kameni plagioclases. Our data suggest that the Kameni plagioclases record a short history, indicating small resident time and possible crystallization during the magma ascent, whereas the Minoan crystals do not testify any relationships with both the coeval mafic magmas and the later Kameni system.

www.minersoc.org
DOI: 10.1180/minmag.2013.077.5.4