Crystallization kinetics: A probe of magmatic and eruptive processes in volcanic systems

C. AGOSTINI[1]*, M.R. CARROLL[1] AND P. LANDI[2]

[1]University of Camerino, Geology Division, via Gentile III da Varano, Camerino, (MC) Italy (*correspondence: claudia.agostini@unicam.it; michael.carroll@unicam.it)
[2]INGV Pisa Division, via della Faggiola 32, Pisa, (PI) Italy

The main objective of this experimental study is to constrain and quantitatively model the complex solidification process that transforms a magma in a solid material. During this research there will be studied nucleation and growth of crystalline phases induced by both decrease in temperature and by decrease in $P(H_2O)$ at constant temperature.

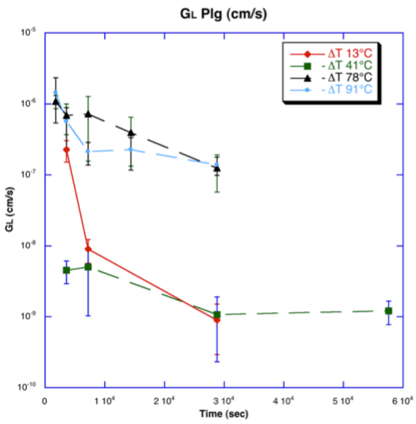

Figure 1: Figure showing Plg growth rate (GL) vs duration of decompression experiments for different ΔT, for Stromboli case.

Discussion of Results

This research concerns two different volcanic systems, Pantelleria and Stromboli, to better understand how crystallization kinetics can affect different magma compositions (in this case peralkaline rhyolites and basalts).

The study of crystallization kinetics through phases growth rates [1] (Couch *et al.*), together with the calculation of nucleation density and nucleation rates [2] (Hammer *et al.*) represent a step toward the estimation of the time scales of magmatic processes in volcanic systems and the interpretation of shallow magmatic processes such as time and velocity of magma ascent.

[1] Couch *et al.* (2003) *Am.Min.***88**, 1471-1485. [2] Hammer *et al.* (1999) *Bull Volcanol* **60**, 355-380.

Subduction-related or subdution-modified source? The case of Central-Eastern Anatolia volcanism

SAMUELE AGOSTINI[1], M. YILMAZ SAVAŞÇIN[2] AND PIERO MANETTI[3]

[1]Istituto di Geoscienze e Georisorse-CNR, Pisa – Italy (s.agostini@igg.cnr.it)
[2]Tunceli Universitesi, Tunceli – Turkey (yilmaz.savascin@deu.edu.tr)
[3]Dipartimento di Scienze della Terra, Università di Firenze, Firenze – Italy (piero.manetti@unifi.it)

Neogene volcanic rocks are widespread in Central Anatolia, between Konya and Kayseri, and Eastern Anatolia, in the region enclosed among Adana, Sivas and Diyarbakır. They occur as large ignimbrite sheets, lava plateaus, monogenetic cones as well as big stratovolcanoes. Some of these rocks are calc-alkaline, from basalts to rhyolites, while others are basanites, tephrites, alkali basalts and trachy-basalts, characterized by alkaline, mostly sodic, affinity.

No clear time and/or space separation between calc-alkaline and alkaline rocks, and no sharp chemical and/or isotopic boundary may be traced. Rather there is a gentle transition, with many samples characterized by intermediate features. As an example, alkaline rocks have Mg# varying from 72 to 45, $^{87}Sr/^{86}Sr$ from 0.7034 to 0.7055 and Ba/Nb from 5.0 to 11, whereas the same parameters span in the ranges of 71-45, 0.7039-0.7056 and 11-163, respectively, in the calc-alkaline basaltic samples. Thus, all the observed data point out for the involvement of two different mantle sources in the genesis of this magmatism, and most samples seem to be derived from interactions of these different sources.

Furthermore, the distribution of calc-alkaline rocks is not strictly linked with respect to subduction dynamics. Large volumes of very young (<2 Ma) calc-alkaline rocks are found in Kapadokyan region, in Central Anatolia, even if current subduction is very slow, or stopped at all. More to the east, some calc-alkaline rocks, are found both predating and postdating the 15 Ma Arabia-Eurasia collision, either in the upper turkish plate or the Arabian foreland.

The Miocene to Pliocene calc-alkaline rocks of Central and Central-Eastern Anatolia are sourced in a subduction-modified mantle wedge. Anyway, the occurrence of calc-alkaline magmas intimately connected with intraplate-type magmas, the presence of transitional samples, the lacking of strict connections with the subduction dynamics and geometry in the calc-alkaline rocks indicate that the metasomatizing event of the mantle wedge is in this case decoupled from the event responsible for the partial melting.