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Towards Time-Scaling of Mixing for the Campanian Ignimbrite: Systemic Variation in Sr-Isotopic Composition from Mixing Experiments

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Eruptions in the Campi Flegrei caldera, the most dangerous volcanic setting in Europe, are thought to be triggered by short-term pre-eruptive mixing of trachytic to trachydacitic resident and new basaltic, trachyandesitic (=shoshonitic) magma, in shallow magma chambers (e. g. Arienzo et al, 2008, Bull. Volcanol.). Previous geochemical and volcanological data on the Campanian Ignimbrite, (>150 km3, 39 Ma), in Campi Flegrei, point towards a layered reservoir, which evolved from the replenishment of the magma chamber with shoshonitic magma and short-term pre-eruptive mixing between a trachytic and a phonolitic trachytic magma. With the purpose to experimentally study the mobility and homogenization of Rb-Sr isotopes in this system, we performed mixing experiments using natural phonolitic trachytic (end-member A - S. Nicola type) and trachytic (end-member B – Mondragone-type) samples, representing the two end-members involved in the origin of the Campanian Ignimbrite.

Resultant glasses from a time series, ranging from 1-hour up to 1-week, under constant flow velocity (0.5 rotations per minute; after De Campos et al., 2008. Chem. Geol.), have been analysed with respect to the Rb- and Sr-systematics. Our results reveal a progressive homogenization of the contrasting Sr-isotopes towards a hybrid value. With increasing experimental duration a clear decrease in the standard deviation of isotopic ratios has been observed, reflecting progressive isotopic homogenization. Our results also support the effectiveness of mixing in the Campi Flegrei reservoirs, in liquidus, under high temperature, before the onset of fractional crystallization.

Since different eruptive events from Campi Flegrei can be well characterized by means of isotopic composition, the main goal for the present study will be to use experimental data and numerical modeling in order to estimate time scales of mixing associated with the eruption of the Campanian Ignimbrite, and then compare them to the several other volcanic events in Campi Flegrei. The results to be presented will be corrected according to the recently developed numerical modeling by Perugini et al. (in print, Bull. Volcanol.).