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Decoupled convection cells effecting unmixing in natural alkaline magmas: $^{87}Sr/^{86}Sr$-isotopic and Sr-LA-ICP-MS measurements in experimental glasses.

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Geochemical evidence for the possibility of pre-eruptive mixing of magmas in the Campi Flegrei system, from other previous works, has prompted this study of the efficiency of the physical mixing of magmas of sub-equal but distinct composition. We have performed binary mixing experiments for melts obtained from natural mesocratic trachytic (endmember A) and leucocratic phonolitic trachytic (endmember B) samples from the Campanian Ignimbrite, in Italy.

The experiments take the form of a time series of mixing at constant temperature (1300^oC) and shear rate (0.5 RPM). After 16, 25 and 169 hours, under constant mixing, separate convection cells originated. For the 25-hour, the bottom cell shows flow directions parallel to the bottom and side walls of the crucible and the top one, has contrasting flow directions, with an around 90^odifference in comparison to the bottom directions. Microprobe analysis of the products indicate a complex layering of cells bounded by clear gaps in oxide ratios and containing compositional gradients.

In order to test the existence of decoupled convection in this system, we performed further $^{87}Sr/^{86}Sr$-isotopic and Sr- LA-ICP-MS-measurements, using the 25-hours experimental glasses as starting materials.

The Sr-content (from XRF) of whole rock samples from endmember A is 600 +/- 50 ppm and 30 +/- 3 ppm for endmember B. These mean values correspond to following mean isotopic differences in the endmembers: A= 0.70731 +/- 1 and B= 0.70746 +/-

1.

LA-ICP-MS-measurements of the experimental glasses, along the same profile, which had been previously measured for major elements, depict variations of Sr-contents. They show a tendency towards a well-mixed layer in the bottom cell, with values ranging around 450 ppm, while the upper cell shows a well defined diffusive layer, separated by a clear compositional gap at the second interface. Towards the top of the cell there is once more the tendency of Sr to form a well-mixed layer, around 100 ppm.

$^{87}Sr/^{86}Sr$ results evidence a value of 0.707374 +-8 for the upper cell and 0.707320+-10 for the bottom one. These values are certainly dominated by the Sr-variation along the cells, previously reported, which strongly control the distribution of the isotopes in time.

Our data point towards mixing and unmixing effected by double diffusive convection in the system. This preliminary work will be further complemented with data on the variation of other trace elements (Perugini et al., in prep.) and isotopes in this system, from experiments with different durations.