Magma emplacement durations and rates and the dynamics of magmatism and volcanism

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Protracted emplacement durations for large laccoliths, plutons and batholiths have been infered from radiometric dating. Analysis of conduit fluxes, short crystal residence times inferred from diffusion chronometry and field evidences all support a model of incremental emplacement of igneous bodies where discrete pulses are interrupted by periods of inactivity. According to this model, at least two rates of magma intrusion can be defined: the short-term emplacement rate of an individual pulse and the long-term emplacement rate of the entire igneous body.

Long-term emplacement rates, which may vary over time, control the thermal state of the igneous body and crust. The mechanical ability of the crust to accommodate pulses of magma depends on its thermal state and on short-term emplacement rates. Magma emplacement at high rates and frequency in a thermally imature and thus rheologicaly brittle crust results in fracturing and eruption, whereas magma storage is favoured on longer timescales in a thermally mature crust[1]. Intrusive/eruptive ratios depend on both short and long-term rates and vary over time in a given magmatic system. The growth of large magma chambers where large-scale convection and magma mixing can happen is only possible for a restricted range of emplacement rates.

At deep crustal levels, incremental magma emplacement implies that different timescales control differentiation. Cooling of rapidly emplaced pulses results in the generation of silicic melts on a short timescale, but the magma reservoir as a whole heats up, remelts and possibly assimilates crust on a much longer timescale.

A global understanding of magma dynamics requires dating tools that can discriminate between different processes and identify the different timescales involved.

[1] Jellinek & de Paolo (2003) *Bulletin of Volcanology* **65**, 363-381

The reaction products during the preparation of granites for the trace elements analysis by ICP-MS

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At present time an essential part of geochemical researches is detection of accompanying elements in different rock and mineral types and analysis of their distribution mechanisms. Last years the main analytical technique for that is ICP-MS. The main problem is sample preparation of geological matrixes. Today there are quite many schemes decomposing of these samples, but most of them are multistep, labor- and time-consuming. Microwave decomposition systems are usually used for intensification of the sample preparation. A serious difficulty for acid revelation is provoked by high-Si magmatic rocks, particularly granites. For the ICP-MS method it is necessary to transform sample to the solution completely, but the granite decomposing can't be always done integrally by using mentioned above schemes. Therefore we've been tried to detect undecomposed fraction at each stage of chemical sample preparation. For that purpose generated sediments were selected, dried and analyzed using scaning electron microscopy with energy dispersive and wave dispersive X-ray microanalysis methods after each revelation step. Sample SG-3 was used for the experiment. Samples decomposed in 3 stages: $HF:HNO_3$ (5:1) – HCl - HNO_3.

Supernatant liquid was analyzed by ICP-MS method. During the experiment it was revealed that a full decomposing of matrix was accompanied by generation of insoluble residue of Al, Ca, REE fluoride at the first stage. Then fluoride of REE transform to the solution on next stages. But at that on the surface of new growth residue ($0,01Na_2O \times 0,05(Mg,Fe)O \times 0,05Al_2O_3 \times 0,09SiO_2 \times 0,13K_2O \times 1,17F$; $0.03Na_2O \times 0.1MgO \times 0.13Al_2O_3 \cdot \times 1.4F$) take place fractional sorption and defective inclusions of Ta, Nb, Zr, Y, La, Ce,.

The scheme of chemical preparation of rock samples was change on the base of our recently received data. In this case the main aim of more careful methodics was a reduction of part of modified solid phases on the first stage of resolution. The sample with weight about 0.1 gram was dissolved in the complex $HF - HCl - HNO_3$ for three stages of acid solutions and was controlled in the open system. As the result of this scheme of sample preparation, the content of initial potassium-bearing solid phase was altered to that of ($0,01K_2O \times 0.08(Mg,Fe)O \times 0.08Al_2O_3 \times 1.01F$). The following resolution was defined an increase of trace element concentrations in the supernatant liquid.