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High resolution Rb-Sr mapping of micas

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Coupling the newest generation of reaction cell ICP's with laser ablation has proven to open up many new research avenues, in particular in-situ beta-decay based dating (e.g., Rb-Sr, Lu-Hf, K-Ca, Re-Os). In-situ Rb-Sr dating of micas has been given most attention so far. Sensitivity, availability of standards and data reduction schemes are here advanced enough that single spot dating is possible in many instances [1]. Following this approach, I will present a simple routine that allows age mapping with a spatial resolution of 30 μm with a speed of more than 250 spots within one hour.

Such a high spatial (apparent) age resolution has otherwise almost exclusively been reached using the U-Pb decay system. The question now is what can we learn from it? Importantly, such a high spatial resolution is allowing to couple age mappings with microtextural observations. Furthermore, as most ICP's with reaction cell capabilities are quadrupole-based, isotope analysis can be easily combined with major and trace element concentration measurements at the same laser spots ("non-split-stream").

Combining results from major, trace and isotope analysis and microtextural observation has important consequences for interpreting apparent age zonations. It is in principle possible to distinguish on the one hand between textures clearly derived from fluid infiltration and on the other hand crystal growth-related areas, apparently unaffected by secondary recrystallization. While the first instance can be interpreted in the context of petrochronology, the latter instance seems to fulfil criteria needed to apply the concept of thermochronology. It is one aim of this study to raise attention for finding a common language across those two rather popular fields within geochronology.

[1] Rösel & Zack (2022), Geostandards and Geoanalytical Research, doi: 10.1111/ggr.12414