

Apatite fission track response to fluids: an experimental approach

Contact person: Dr. Joshua Davies, Dr. Richard Spikings

Context

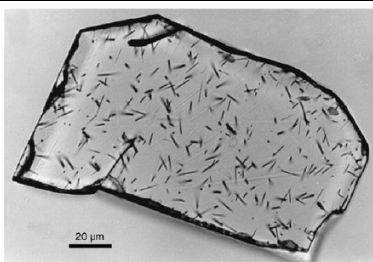
Apatite fission track analyses are one of the most important ways to investigate the low temperature temporal histories of geological samples. This technique is especially useful for studying sedimentary basins from which the thermal history is intertwined with oil maturation and extraction. The thermal events that trigger oil migration/extraction processes will also cause fluid movement in the basin, and the effects of these basinal fluids on the apatite fission tracks is currently unknown. It is known that fluid interaction plays a major role in catalysing the recrystallization of metamict zircon, therefore it is also likely to have an effect on disordered (full of fission tracks) apatite. If fluid interaction is found to have an effect on apatite fission track length the result may have profound implications for studying the low temperature evolution of sedimentary basins. Also if fluids are found to have no effect on the fission tracks, the traditional approach will be validated. The goal of this study is to experimentally determine the effect of fluid interaction on apatite fission tracks by placing apatite crystals into fluids of different compositions at different temperatures and times.

Objectives and Methods

The planned work will be conducted on a megacryst of Apatite from Madagascar collected in 2016. The crystal will be sectioned into equal sized pieces and a sub set will be used for conventional fission track analysis. The remaining crystal pieces will be subjected to fluids of various compositions, temperatures and times. All apatites will be imaged and chemically measured by electron microprobe and laser ablation analysis if necessary.

Literature

Filip et al., (2007) Apatite fission track implications for timing of hydrothermal fluid flow in Tertiary volcanics of the Bohemian Massif. *Journal of Geosciences*. 52, 211-220; Bray et al., (1992) Thermal history reconstruction using apatite fission track analysis and vitrinite reflectance: a case study from the UK East Midlands and Southern North Sea. *R.F.P. Hardman (Ed.), Exploration Britain: Geological Insights for the Next Decade, Geol. Soc. Spec. Publ.*, 67 (1992), pp. 3-25. Geisler et al., (2007) Re-equilibration of zircon in aqueous fluids and melts. *Elements*, 3 (1) 43-50



Websites to visit :

http://cms.unige.ch/sciences/terre/research/Groups/isotope_geology/isotope%20group.php
http://cms.unige.ch/sciences/terre/people/personal_pages/RichardSpikings/RichardSpikings

Choice of orientation and modules:

Orientation GATO (Geochemistry, Alpine tectonics and Ore Deposits); Modules: Isotope Geochemistry, Analytical Toolbox, Magmatic Petrology.