Fission track research in Halifax, Nova Scotia: technical procedures and research directions in a changing fiscal environment

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The Fission Track Research Laboratory (FTRL) at Dalhousie University is now well established with new equipment and set procedures. The bulk of the FT work is dedicated to apatite, using the external (mica) detector method. Counting and track length measurement are performed in dry conditions utilizing Autoscan™ AS3000 stages mounted on Zeiss Axioplan microscopes. Irradiations are performed in the Slowpoke-2 reactor located in the same building. The 7 hours of irradiation in the lower flux (5.4×10^{11} n/cm^{-2} s^{-1}) of the Slowpoke-2 reactor lead to less internal gradients and inter-capsule variation than irradiation for 900 seconds in the 5×10^{12} n/cm^{-2} s^{-1} flux previously used at the McMaster University reactor.

Enhancement of confined tracks by irradiation with ^{252}Cf fission fragments is done routinely on aliquots of apatite separates. Samples are irradiated at Rensselaer Polytechnic

Institute, Troy, New York and an enhancement of ca. 500% in confined track visibility is normal. Apatite composition is monitored using etch pit size and shape and, if required, samples are analyzed using a JEOL 733 superprobe for F, Cl, and O, allowing for a calculation of OH and CO_2 by subtraction. The probe also determines La, Ce, Nd, Nb, Y, and Sr, which can be used in provenance studies. Modelling is done using Sean Willett's (Penn State University) inverse modelling algorithm, which has been upgraded by Dale Issler (GSC - Calgary).

University research funds for operation are non-existent, and grants from government research organizations are increasingly scarce. The lab therefore does more than 1/2 contract work to finance technical personnel, students, and development research. All revenues are reinvested in the lab. Diversification has been necessary, and the lab's equipment is shared with other research groups involved in mineral deposit exploration and environmental research. In several projects we are coordinating FT thermochronology with K-feldspar $^{40}Ar/^{39}Ar$ thermochronology (with Peter Reynolds, Dalhousie). In addition, we are contributing uranium distribution maps of tooth enamel for the Dalhousie University, Department of Dentistry, and radiation dosimetry for the Dalhousie Luminescence lab of Dorothy I. Godfrey-Smith. We are as well intercalibrating FT, Thermoluminescence (TL), Optically Stimulated Luminescence (OSL) and $^{40}Ar/^{39}Ar$ in suites of rocks younger than 0.5 Ma. The three labs have informally associated as a Geochronology Centre. We are also setting up our own vitrinite reflectance (R_0) equipment and new fluid inclusion heating and freezing equipment, for integrated basinal studies.