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Modelling the Combined Impact of Eroding Topography and Fluid Flow on Apatite Fission-Track and (U-Th)/He Data

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Geologic processes such as topographically driven fluid flow and erosional landscape evolution can significantly influence the thermal state of the upper crust and, thus, the thermal history of rock samples used for thermochronological studies. In particular, fluid circulation along fault zones can result in substantial temperature anomalies in the adjacent rocks (Lampe and Person, 2000; Bächler et al., 2003). As a consequence, any refined interpretation of apatite fission-track (AFT) and (U-Th)/He data requires a thorough understanding of the upper crustal temperature field and its evolution through time and, thus, more sophisticated modelling techniques.

The objective of this study is to investigate quantitatively the influence of eroding topography combined with convective heat transfer by topographically driven fluid flow on low-temperature thermochronometer data, such as AFT or (U-Th)/He. To achieve this goal, the landscape evolution is described by a diffusion equation, and the fluid flow by a numerical model using finite element techniques and the subsurface flow and transport simulation software FEFLOW®. The approach also allows tracking the time-temperature (tT) histories of individual particle points as erosion moves them closer to surface. These tT-paths are then used in a forward modelling approach using HeFTy® (Ketcham, 2005) to determine the expected AFT and (U-Th)/He ages and AFT length distributions.

Bächler, D., Kohl. T. & Rybach, L. (2003): Impact of graben-parallel faults on hydrothermal convection; Rhine Graben case study. Phys. Chem. Earth, 28: 431-441.

Ketcham, R. (2005): Forward and inverse modeling of low-temperature thermochronometry data. Reviews in Mineralogy & Geochemistry, 58: 275-314.

Lampe, C. and Person, M. (2000): Episodic hydrothermal fluid flow in the Upper Rhinegraben (Germany). Journal of Geochemical Exploration, 69/70: 37-40.