Two-dimensional finite element models of convective heat transfer in the upper crust — implications for the interpretation of fission-track data *Poster*

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Fission-track (FT) thermochronology is a tool routinely used for studies of surface denudation because of its sensitivity to the low temperatures found in the uppermost part of the crust. FT ages and associated track length distributions are regularly interpreted assuming a steady-state temperature field and only conductive heat transfer. However, application of the method to thermochronological studies based on such interpretations may lead to invalid conclusions, if the temperatures at a certain depth had actually varied with time. For example, the convective transfer of heat by hydrothermal fluids can cause transient thermal events within the upper crust. In particular, fluid circulation along fault zones can result in substantial convective heat transport and cause temperature anomalies in the adjacent rocks (Zuther & Brockamp 1988, Fleming et al. 1998, Lampe & Person 2002, Bächler et al 2003). As a consequence, any refined interpretation of FT data requires a thorough understanding of the upper crustal temperature field and its evolution through time.

The main objective of this study is to assess quantitatively how convective heat transport influences the upper crustal temperature field as well as the cooling ages and track length distributions observed in apatite FT data. Modelling utilizes Finite Element techniques and the software FEFLOW, respectively. In-depth parameter studies (including fault geometry, erosion rate, hydraulic potential, hydraulic and material properties) are conducted on two-dimensional (cross-sectional) models of fault zones. After evaluating the relative importance of different variables relevant to fluid circulation in a palaeogeothermal system, the time-temperature (tT) histories of particle points are tracked as erosion moves them closer to surface. These tT-paths are used in a forward modelling approach to determine the expected FT age and track length distributions. For each parameter study, a corresponding set of FT parameters is produced, thus, providing a catalogue of FT ages and track length distributions, which will help to interpret real data sets.

One of the goals of the project is to investigate the regional impact of convective heat transport on the interpretation of FT data and other thermal data from the Black Forest (SW-Germany). The modelling techniques outlined above will be applied to field data from the Baden-Baden and Offenburg troughs in the northern and central Black Forest.

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