A further step toward a thermochronological 3-D model of the SE Black Forest *Poster*

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Fission-track (FT) data always depend on the thermal history of a 3-D geological complex. Therefore it is expedient to display FT data sets in 3-D models. Such a model in which tectonic, sedimentological and hydrological features are combined can greatly improve the interpretation of the palaeo-thermal pattern derived from FT analyses.

Since 1988 several FT studies have been conducted in the Black Forest (BF) (Michalski 1988, Wyss 2000, Timar-Geng et al. 2004, 2005). Timar-Geng et al. (2006) analyse the crystalline basement and the Permian Rotliegend beneath the Mesozoic units in the Tabular Jura (TJ) east of Basel, Switzerland, using samples taken from the three Nagra boreholes at Kaisten, Riniken and Leuggern.

In particular Timar-Geng et al. (2005, 2006) characterise the thermal history of this pre-Mesozoic basement. For the BF they estimate at least one heating phase during the lower and middle Mesozoic while similar heating could not be observed in northern Switzerland. However, the FT-data in both regions show moderate to rapid cooling during the Cretaceous and Lower Eocene, which was followed by an Upper Eocene heating event.

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The software package GOCAD (Geological Objects Computer-Aided Design) was used to build a digital elevation model (DEM), which provide a new detailed view of these FT data sets. The model is located about 20 km east of Basel, Switzerland, and extends over an area of about 21 km by 24 km and spans a vertical height difference of about 2 km.

The data sets described above along with two additional FT analyses from the Buntsandstein which lies directly on the BF crystalline, were compiled and plotted at their topographic heights in the DEM.

The FT central-ages (Galbraith & Laslett 1993) of this region range between 25 ± 2 Ma and 98 ± 6.5 Ma. The topographic positions extend between -1412 m at the Borehole Riniken and 960 m in the BF with mean sea level as a reference.

FT central-age isochron surfaces were drawn in order to visualize the thermal evolution within the model range. Because the FT central-ages also correspond to a closure temperature, these surfaces can also be considered an isotherm. The FT closure temperature of apatite is about 90 ± 30°C (Laslett et al. 1987). Therefore each surface shows the position and shape of the ca. 90°C isotherm of a specific age.

This 3-D model points out an important difference in the thermal evolution of the BF und the TJ. The vertical distance between the isothermal surfaces increases from north to south. Between 90 Ma and 60 Ma the ca. 90°C isotherm drops at the Kaisten borehole by 1000 m while in the same time span in the BF a lowering of the same isotherm by 300 m can be observed. In the eastern part of the model this feature is not as marked as in the west but nevertheless it is observable.

To explain this entirely different thermal evolution it is necessary to turn to the tectonic and other geological features of the region. South of the exposed BF crystalline and beneath the TJ there lies an old Variscan structure: the Permo-Carboniferous trough (PCT). This trough strikes in WSW-ENE direction and extends from Lake Constance to the Bresse Graben and contains up to 6000 m of Palaeozoic sediments. Additionally, some Variscan fault structures strike in WNW–ESE direction and cut both the BF an the PCT, for example the Eggberg Fault and the Vorwald Fault. Beside the tectonic structures the hydrological characteristics played an important role during the palaeo-thermal evolution. Circulating hot fluids controlled the thermal pattern. Variscan faults were often reactivated during the Mesozoic (e.g. Wetzel et al. 2003) and also during the formation of the Upper Rhine Graben. (e.g. Illies 1967) These faults are the major water-conducting features in the crystalline basement of the BF, joints and fracture networks are tributaries. Below the aquifers within the Mesozoic of the TJ, the PCT trough sediments predominantly act as an aquitard. Only the border faults of the trough were important pathways for fluids (Thury 1994).

Considering the Mesozoic sedimentological history of the region it is unlikely that fault movements are responsible for the different palaeo-thermal pattern of the BF and the TJ. Only different magnitudes of heat flow caused by hydrothermal circulating fluids can explain the 'warm' BF crystalline in comparison to the 'cold' basement of the TJ at the transition between the Mesozoic and Tertiary.

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