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Post 5Ma thrusting in the Northern Alpine Foreland Basin - insights from structural geology and new (U-Th)/He and Fission Track data

Christoph von Hagke (1), Charlotte Cederbom (2), Julia Lindow (3), Onno Oncken (1), and Fritz Schlunegger (4)

(1) GFZ German Research Centre for Geosciences, Potsdam, Germany (vonhagke@gfz-potsdam.de / +49 (0)331/288-1370), (2) SGI Swedish Geotechnical Institute, Linköping, Sweden (charlotte.cederbom@swedgeo.se), (3) University of Bremen, Department of Geosciences, Bremen, Germany (lindow.julia@uni-bremen.de), (4) Universität Bern, Institute of Geological Sciences, Bern, Switzerland (schlunegger@geo.unibe.ch)

Several hypotheses for the driving mechanism(s) behind late Neogene erosion in the Alpine region have been argued for in the past, in particular climate, tectonic and geodynamic forcing. The aim of this study, which is part of the ThermoEurope initiative, is to investigate the significance of Pliocene tectonic forcing on the thrusted part of the North Alpine Foreland Basin (NAFB). We apply thermochronology and structural geology to constrain the timing, location and magnitude of tectonic reactivation and erosion in the thrusted part of the basin and the adjacent units.

Kilometre-scale erosion and thrust reactivation in the NAFB during the Pliocene is argued for based on apatite fission-track (AFT) data from the Swiss part of the basin (Cederbom. et al., 2004; Cederbom et al., submitted). A pilot (U/Th)-He study, that was carried out in the Rigi area, in the thrusted part of the Molasse Basin partly confirms the AFT results (Lindow et al, 2009). Based on these studies several suitable horizontal and complementary vertical profiles, transecting the Swiss, Austrian and German part of the basin have been chosen for further investigations.

Dense sampling for (U-Th)/He and FT dating has been combined with structural investigations. Additional to the first data set, so far 47 FT ages and 75 single grain (U-Th)/He ages have been produced.

Here we present data from the Entlebuch and the Rigi profiles, which are the two westernmost horizontal transects. Both are crossing the triangle zone between the thrusted Subalpine Molasse and the flat-lying Plateau Molasse. Most of the ages are considerably younger than their depositional age. Samples located south of the triangle zone have been deposited between 35 and 25 Ma but have cooling ages between 3 and 15 Ma. The ages of the samples in the Plateau Molasse in contrast have been deposited between 25 and 17 Ma and show ages between 21 and 5 Ma. In the triangle zone itself a jump to older ages can be observed.

First, the data set corroborates km scale erosion. Second, we argue that glacial erosion cannot account for the young ages alone. Instead, post 5 Ma thrusting in the triangle zone is necessary to explain the observed AFT and (U/Th)-He age jump. Different driving mechanisms behind this erosion event have to be tested. Therefore, it is necessary to constrain if this thrusting is a local phenomenon or if it is present along-strike the orogen. Both presented profiles lie south of the Jura fold and thrust belt, where cessation of thrusting remains unclear. Consequently, the study area is extended to the east over the termination of the Jura Mountains.

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