Geophysical Research Abstracts
Vol. 19, EGU2017-7219, 2017
EGU General Assembly 2017

Constraining the near-surface response to lithospheric reorientation: Structural thermochronology along the TRANSALP geophysical transect

Christoph Glotzbach, Lukas Büttner, and Todd Ehlers
Department of Geoscience, University of Tuebingen, Germany

Tomographic analyses of the lithosphere structure underneath the Alps suggest a complex geodynamic history (e.g. Lippitsch et al. 2003), indicating, among other things, switches in the direction of subduction. A subduction polarity switch is proposed to have occurred in Miocene times between the Central and Eastern Alps (e.g. Lippitsch et al. 2003; Handy et al. 2015). In the Western and Central Alps SE-directed subduction of European continental lithosphere occurs, whereas NW-directed subduction of Adriatic lithosphere occurs further east (e.g. Kissling et al. 2006). The subducted slab steepens at the transition to the Eastern Alps, roughly at the position of the TRANSALP geophysical profile (S. Germany to N. Italy). This lithospheric reorientation was pre-dated by slab breakoff and also involves the delamination of the lower lithosphere, both processes producing distinct long-wavelength deformation (e.g. Gerya et al. 2004). Thermochronological data can be used to study the surface response to such a long-wavelength deformation.

We present new apatite and zircon (U-Th)/He ages of 23 samples collected along ~210 km of the TRANSALP profile. The samples were collected along a balanced cross section the TRANSALP profile (e.g. Lüschen et al. 2004) across individual structures that can be tied to deeper, seismically imaged, structures. The thermochronometer ages provide a record of exhumation related to both crustal shortening and post deformation erosional exhumation. Interpretation of the data is in progress and being used to discriminate between competing kinematic/geometric models, and the timing of major fault activity. Variations in exhumation along the section will also unravel the timing and shape of possible long-wavelength rock uplift event(s).

References

Gerya, T.V., Yuen, D.A., Maresch, W.V. 2004. Thermomechanical modelling of slab detachment. Earth Planet. Sci. Lett. 226, 101-116.

Handy, M.R., Ustaszewski, K., Kissling, E. 2015. Reconstructing the Alps-Carpathians-Dinarides as a key to understanding switches in subduction polarity, slab gaps and surface motion. Int. J. Earth Sci. 104, 1-26.

Kissling, E., Schmid, S.M., Lippitsch, R., Ansorge, J., Fügenschuh, B. 2006. Lithosphere structure and tectonic evolution of the Alpine arc: new evidence from high-resolution teleseismic tomography. In: Gee, D.G., Stephenson, R.A. (eds) European Lithosphere Dynamics. Geol. Soc. London Mem. 32, 129-145.

Lippitsch, R., Kissling, E., Ansorge, J. 2003. Upper mantle structure beneath the Alpine orogen from high-resolution teleseismic tomography. J. Geophys. Res. 108, 2376, doi:10.1029/2002JB002016.

Lüschen, E., Lammerer, B., Gebrande, H., Millahn, K., Nicolich, R., TRANSALP Working Group 2004. Orogenic structure of the Eastern Alps, Europe, from TRANSALP deep seismic reflection profiling. Tectonophysics 388, 85-102.