Geo- and thermo- chronology of anatase as benchmarks for basin evolution

I. DUNKL[1], A. GERDES[2], R. WOLFF[1], D. BOTOR[3], A. WELLHÄUSER[1], M. DÖHMANN[1] AND H. VON EYNATTEN[1]

[1]University of Göttingen (idunkl@gwdg, rwolff@gwdg.de, awellhaeuser@web.de, maxdoehmann@gmx.de, heynatt@gwdg.de)
[2]Goethe-University Frankfurt (gerdes@em.uni-frankfurt.de)
[3]AGH University of Science and Technology in Kraków (botor@agh.edu.pl)

Anatase occurs commonly in siliciclastic rocks as detrital or authigenic accessory mineral. We studied the geochemistry and applicability of anatase for U-Pb and (U-Th)/He geo/thermochronology. The well developed, euhedral blue and yellow crystals were collected from a Carboniferous siliciclastic sequence of the Intrasudetic Basin (SW Poland). Our data reveal that:

- The uranium and thorium concentrations are typically below 5 ppm, the common lead content is variable.

- The laser-ablation IC-PMS U-Pb geochronology yielded Middle Jurassic intercept age.

- The (U-Th)/He ages cluster around 75 Ma.

- The diffusion experiments reveal multiple diffusion domains indicating that the closure temperature of the anatase He thermochronometer is below ca. 100 °C.

The fully euhedral character of the anatase crystals indicate authigenic formation, thus we interpret the post-sedimentation U-Pb age as formation age of the crystals. Titanium mobilization was connected to the breakdown of biotite and volcanic lithoclasts and glass within the sandstones. The Jurassic U-Pb age matches well to the illite K-Ar ages detected in several central European basins indicating enhanced fluid flow [1]. The (U-Th)/He age is close to the Late Cretaceous regional cooling event of the Sudetes [2]. We conclude that anatase can carry essential age information for understanding the timing of events in basin evolution.

[1] Ziegler, K. (2006) *Clay Minerals* **41**, 355-393. [2] Danišík, M. et al. (2012) *Tectonics* **31**, TC2003.