Geophysical Research Abstracts
Vol. 12, EGU2010-13075, 2010
EGU General Assembly 2010

Double dating of detrital zircon by fission-track and LA–ICPMS U/Pb analysis: new perspectives in decomposing mixed provenance signatures

Tamás Mikes (1,2), Teresa E. Jeffries (3), István Dunkl (1), Raimon Tolosana-Delgado (1,4), and Hilmar von Eynatten (1)

(1) Geowissenschaftliches Zentrum der Universität Göttingen, Sedimentologie/Umweltgeologie, Göttingen, Germany, (2) Present address: Universität Hannover, Institut für Geologie, Hannover, Germany (mikes@geowi.uni-hannover.de), (3) Mineralogy Department, The Natural History Museum, London, UK, (4) Present address: LIM-CIIRC, ETSECCPB, Universitat Politècnica de Catalunya, Barcelona, Spain

A novel approach combining fission track (FT) and in-situ LA–ICPMS U/Pb isotopic analyses in single detrital zircon grains is used to trace the exhumed sources of Tertiary synorogenic sediments in the Dinarides. Grains were dated by the FT method, and their interiors were imaged by SEM-CL to avoid ablation of inherited or other unsuitable domains. U/Pb isotopic compositions were determined by an instrument setup of a 213 nm Nd:YAG laser source coupled to a quadrupole-based ICP-MS, and an analytical protocol providing a cost-effective sample throughput (70-100 grains per day) while maintaining high analytical precision and accuracy. CL-control and a good spatial resolution helped suppressing age bias, as justified by a notably high proportion (>90%) of concordant (±5%) grain ages. Finally, the FT and U/Pb ages were integrated for each grain using a bivariate statistical algorithm that takes the different precisions permitted by the two dating techniques into account.

The zircon double dating approach yields valuable insights into the thermal history of source terrains of synorogenic sediments both in the Outer Dinaride foreland basin and in the Dinarides-Tisza collisional zone. We can isolate several clusters of characteristic pairs of crystallization/cooling ages, which pin-point Alpine tectonostratigraphic units with a confidence that could not be achieved by using the two dating techniques separately.

The Adriatic basement of the Dinarides affected by the major Jurassic–Early Cretaceous cooling event was not the exclusive source for the siliciclastic fill of these Tertiary basins. The distributary systems involved much detritus from Ordovician and Late Permian magmatic units affected by a Late Cretaceous thermal event; such units are not typical in the Dinarides. A major sediment input from the Austroalpine, Tisza and Pelagonian Units in the Tertiary is the most likely scenario for the evolution of the Dinaride basins.