Geophysical Research Abstracts
Vol. 13, EGU2011-12861-1, 2011
EGU General Assembly 2011

The tectonic evolution of the Biharia nappe system documented by structural and thermochronological data. Apuseni Mountains, Romania.

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The Apuseni Mountains in Romania take a central position in the Alpine Carpathian Dinaride system and separate the Pannonian basin in the West from the Transylvanian basin in the East. Following the final Mid-Cretaceous obduction of the East Vardar ophiolite a NW-vergent nappe stack formed, which involves from bottom to top: Tisza- (Bihor and Codru) and Dacia-derived (Biharia) units, overlain by the South Apuseni and Transylvanian ophiolite belt. This study tries to provide new and additional information on the structural and metamorphic evolution of these units, from the onset of obduction during Jurassic times, to the final exhumation processes observed during the Eocene. The study area is located in the SE part of the Apuseni Mountains and focuses on the Biharia system, which is divided in a lower Biharia nappe and an upper Baia de Aries nappe, separated by a greenshist facies metasedimentary succession. Kinematic indicators were used to derive the internal deformation of these metasediments and the surrounding basement units in combination with a thermochronological study based on new 87Rb/86Sr and fission track ages and previously published 40Ar/39Ar data. The integration of newly acquired and existing thermochronological data into time-temperature pathways allows the definition of major tectonic events. These data indicate a major Late Jurassic-Earliest Cretaceous exhumation event of the Biharia system, which is interpreted as thrusting on top of the Bihor and Codru units. Subsequent exhumation of the Baia de Aries nappe during the Mid-Cretaceous times (“Austrian Phase” in local nomenclature) is a consequence of internal nappe stacking in the Biharia system. The Intra-Turonian exhumation event, which was previously related to the backthrusting of Dacia units over Tisza, seems to be recorded differentially in these units. This exhumation is only recorded in the western part of the Biharia system, while the eastern part of the Baia de Aries nappe recorded Mid-Cretaceous ages. Based on these facts, the presence of a major detachment system, presently buried below Campanian and Santonian Gosau sediments can be speculated. Modelling of geochronological data will further be compared and integrated with numerical modelling of the landscape evolution. The hereby generated data and information on erosion and exhumation will be used in associated partner projects of the “Source to Sink” research network which addresses the evolution of the Danube system from the hinterland to the Black Sea.