The Eoalpine Orogen evolution from Permian–Triassic extension to Jurassic–Eocene accretion determined by Zrn U/Pb SIMS, microprobe Mnz and WhM Ar/Ar ages in the Western Carpathians and the Eastern Alps

Marián Putiš[1*], Xian-Hua Li[2], Martin Ondrejka[1], Pavol Siman[3], Zoltán Németh[4], Friedrich Koller[5], Ondrej Nemec[1], Peter Ružička[1]

[1] – Department of Mineralogy and Petrology, Comenius University, Bratislava, Slovakia; [2] – Institute of Geology and Geophysics of the CAS, Beijing, China; [3] – Earth Science Institute of the SAS, Bratislava, Slovakia;[4] – State Geological Institute of Dionýz Štúr, Bratislava, Slovakia, [5] – Vienna University, Austria; [*] putis@fns.uniba.sk

The Eoalpine orogeny segments are characteristic in Alcapia, Tisia, Dacia and Adria microplates (Schmid et al., 2004, 2008; Handy et al., 2010). The Eoalpine events were dated in the Slavonian Mts. (115–110/80 Ma; Balen et al., 2017), Apuseni Mts. (125–100/80 Ma; Dallmeyer et al., 1996, 1999; Reiser et al., 2016), Western Carpathians (135–100/70 Ma; Dallmeyer at al., 1996, 2005; Putiš et al., 2009; Vozárová et al., 2014) and Eastern Alps (100–90/70 Ma; Thöni and Jagoutz, 1993; Thöni, 1999; Dallmeyer et al., 1996, 2008). We searched these events in the Austroalpine-Inner Western Carpathian (AA–IWC) Block of Alcapia (ALCAPA sensu Neubauer, 1992) microplate separated from the Pelsó Block in the south by the Periadriatic-Rába-Hurbanovo-Diósjenö Fault. The IWC Eoalpine Orogen can be traced from the Meliatic–Gemeric–South Veporic (ME–GE–SVE) accretionary wedge in the S, to the North Veporic–Tatric–Infratatric (NVE–TA–IFTA) accretionary wedge in the N. The Eoalpine Orogen of the IWC yields white mica (WhM) ^{40}Ar–^{39}Ar plateau ages of 115–80 Ma or 50–45 Ma in the IFTA (Putiš, 1992) segment, 100–70 Ma or 50–45 Ma in the north-TA segment, 95–80 Ma in the NVE segment, or 125–85 Ma in the SVE and GE segments. Both wedges contain calc-alkaline and A-type volcanic, less plutonic acid to basic bodies of Permian, exceptionally Triassic age (Kotov et al., 1996; Uher and Broska, 1996; Poller et al., 2000; Putiš et al., 2000, 2016; Uher et al., 2002, 2004; Vozárová et al., 2009, 2012, 2015, 2016; Demko and Hraško, 2013; Spišiak et al., 2015) related to Pangea breakdown and the Neotethys opening. The Meliata Unit mid-Triassic silicites, interlayered with N-MORB, contain zircon (247–243 Ma) from a Lower Triassic acid source (Putiš et al., 2011).

The ME–GE–SVE accretionary wedge has formed between 135 and 85 Ma, due to the closure of the Neotethys Meliata BAB and southward subduction of its oceanic and marginal continental crust between 170 and 150 Ma that was dated on blueschist phengite (Dallmeyer et al., 1996; Faryad and Henjes-Kunst, 1997). The exhumation and cooling of the HP rocks between 150 and 130 Ma (rodingite perovskite U/Pb and zircon U–Th/He ages; Putiš et al., 2014, 2015; Li et al., 2014) was driven by the passive continental margin GE and SVE units underthrusting to about 20-30 km depth underneath the Meliata Unit being a part of the upper plate. The D1 burial stage of the GE Unit can be documented by Mnz microprobe isochrone age of 135 Ma from a Permian meta-rhyolite (Vozárová et al., 2014) and the WhM Ar/Ar ages between 130 and 120 Ma from the sheared basement metasediments, followed by the exhumation ages up to 85 Ma (Siman and Vozárová, in prep.). The SVE Unit underthrusting to about 30 km depth in this wedge achieved a higher medium-P greenschist- to lower amphibolite facies conditions (Putiš et al., 1996, 1997; Korikovsky et al., 1997; Janák et al., 2001). A trachyte dyke, crosscutting the Permian–Lower Triassic cover, yielded an older microprobe Mnz isochrone age of 130 Ma, consistent with the D1 WhM Ar/Ar ages around 125 Ma. The younger Mnz isochrone age of 100 Ma is coeval with the D2 WhM exhumation ages of 100 to 85 Ma. The buoyant underthrust continental crust, after mechanical weakening, was exhumed by the mechanism of top-to-the ESE/SE structural unroofing and sinistral transpression (Putiš, 1994). The (ME–)GE–SVE accretionary wedge of the IWC can be correlated with the Upper Austroalpine (UAA) structural complexes of the Eastern Alps (Schuster et al., 2004; Schmid et al., 2004), both representing the Meliatic passive continental margin (Putiš, 1991). We searched the UAA Kreuzeck Massif hanging wall HP Polinik complex overlain by Strieden, Hochkreuz and Steinfeld complexes, thrust over the Ragga complex (Putiš et al., 2002a; Michálek et al., 2012) of the Lower Austroalpine (LAA) position. Similarly, in the eastern Austroalpine margin, the UAA Sieggraben complex (Putiš et al., 1994, 2000, 2002b, 2017; Korikovsky et al., 1998) is overlying the LAA Grobgneis and Wechsel