Biogeographic relationships of faunas indicate wide migration possibilities evidenced not only by planktonic but also by some benthic fossil qroups (trilobites, brachipods etc.). Migrations took place both in equatorial and polar directions of the Devonian paleogeography. Most conspicuous are relationships to the northern shelves of Gondwana to which the Bohemian Massif belonged, expressed in faunal affinities to Carnic Alps, NW Africa, S China and even SE Australia. However, significant were also relationships to shelves of Laurussia documented by faunal affinities to the Rhenohercynicum, Urals and Arctic regions.

The presumption of a vast Rheic Ocean and Ligerian Cordillera as migration barriers is vague for the Devonian time. Sequences of the Bohemian Massif show no support for "Late Caledonian" orogenic processes during the latest Silurian and the early Devonian. In contrary, early Variscan processes starting in Givetian to Frasnian times are clearly evidenced in stratigraphic sequences of several terranes (Centralbohemicum, Saxothuringicum, Lugicum inparticular). The main accretion of terranes in the peripheral parts of the Bohemian Massif belongs to later Variscan movements of mostly Visean age.

MAGMATIC VS. METAMORPHIC DERIVATION OF RARE-ELEMENT GRANITIC PEGMATITES

P. ČERNÝ

Department of Geological Sciences, University of Manitoba, Winnipeg, MB, R3T 2N2 Canada

Granitic pegmatites of the rare-element class typically occur in terrains of the low-pressure amphibolite facies of metamorphism, within the Abukuma metamorphic facies series of relatively steep geothermal gradients. Geobarometry and geothermometry indicate emplacement and consolidation at 4–2 kbar and ~750–650 to ~500–400 °C. Bulk compositions correspond to the thermal minima and eutectics in the Ab+Or+Qtz+H_2O system for the geochemically primitive types, and in the Ab+Ecr+Qtz+H_2O system for the Li-enriched varieties. Modifications of the bulk composition of tourmaline-, phosphate- and lepidolite(±topaz)-rich pegmatites correspond to those experimentally established for the minima in B-, P- and F-bearing systems. Crystallization of even the most complex rare element pegmatites from highly hydrous magmas is also verified by experiments simulating the typical internal structure and mineral assemblages of zoned bodies.

The magmatic nature of the parent medium, from which the rare-element pegmatites solidify in an essentially closed system, is well established and generally accepted, in contrast to diverse aqueous hypotheses that are only of historical interest today. However, the derivation of pegmatite-generating melts is still disputed by some researchers who advocate metamorphic derivation rather than igneous differentiation.

Numerous field- and laboratory-based lines of evidence were established in a multitude of rare-element pegmatite populations that link the pegmatites with late stages of consolidation of specialized fertile (leuco)granites: (1) rare-element pegmatites form facial pods within parent plutons, or transect margins of plutons into their metamorphic envelopes; (2) the pegmatitic rocks constitute cupolas of the fertile granites, or (3) zoned aureoles surrounding the plutons, with the pegmatites progressively differentiated from the interior through the marginal into the extreme exterior dikes; (4) late-crystallizing pegmatite pods trapped within parent granites are locally exact duplicates of exterior pegmatites in the metamorphic roofs of these granites; (5) continuous textural, mineralogical and geochemical evolution links the parent granites and their pegmatite progeny, the geochemical trends being analogous to those known from highly fractionated rhyolite suites; (6) the above-mentioned P–T conditions of consolidation and the bulk compositions fit the tail-end of fractionation expectable in highly evolved granitic intrusions.

Metamorphic models claiming direct anatectic origin of rare-element pegmatite melts (or hydrothermal influx of rare elements into magmatic but barren pegmatites) are based on the absence of outcropping granitic parents, or speculations unsupported by physical evidence. The hypotheses range from low-percentage melting of lithologies pre-enriched in the "pegmatitic" rare elements to hydrothermal influx of these elements into barren pegmatite-generating magmas.

All these hypotheses are burdened by numerous problems: (1) Lithologies that may serve as protoliths extraordinarily enriched in rare elernents (such as evaporites) are scarce in high-grade metamorphic terrains, particularly in Archean terranes; they do not cover the full spectrum of elements represented in complex pegmatites, and they would be prone to devolatization and dispersion early in prograde metamorphism. (2) Extremely low-percentage melting would be required to generate anatectic magmas even remotely similar to complex pegmatites (and only if partition coefficients that work at above ~20% melting could be realistically expected to be valid at 0.5–1% melting). (3) Concentration of rare elements encountered in complex pegmatites would require substantial removal of these elements from very large volumes of available source rocks such as metapelites. (4) Segregation of low-percentage melts (<3%) from enormous volumes of protoliths into restricted spaces occupied by complex pegmatites would be physically difficult, and probably impossible. (5) Where such a segregation feasible, the melts passing through metamorphic lithologies would react with them and lose most of their content of rare elements in the process. (6) Systematics of radiogenic isotopes are sharply discordant between pegmatites and their host rocks, including deep-seated analogs of the latter. (7) Cases of "aborted segregation" of highly fractionated pegmatite melts in statu nascendi within metamorphic protoliths have not been observed.

Alternate mechanisms such as incongruent melting of biotite may overcome the problem of source of most rare elements, but would not solve the other discrepancies. At present, the idea of direct metamorphic derivation of rare-element pegmatites is not supported by any geologically feasible mechanism.

PRE-VARISCAN, VARISCAN AND ALPINE TECTONOTHERMAL EVOLUTION WITHIN THE SOUTHERN CARPATHIANS, ROMANIA: EVIDENCE FROM $^{40}Ar/^{39}Ar$ HORNBLENDE AND MUSCOVITE AGES

R.D. DALLMEYER[1], F. NEUBAUER[2], H. FRITZ[3], V. MOCANU[4]

[1] *Dept. of Geology, University of Georgia, Athens, GA 30 602, USA*

[2] *Dept. of Geology and Paleontology, University, Hellbrunnerstr. 34, A-5020 Salzburg, Austria*

[3] *Dept. of Geology and Paleontology, University of Graz, Heinrichstr. 26, A-8010 Graz, Austria*

[4] *Institute of Geology and Geophysics, University, Vuia Traiana, 6, R-70139 Bucharest, Romania*

Muscovite and hornblende concentrates from basement and some whole rock phyllite samples from Late Paleozoic cover sequences within all major tectonic units from Southern Carpathians, Romania, have been dated to resolve the record of Alpine and pre-Alpine tectonothermal events.

A hornblende concentrate of the Tismana diorite (Danubian parautochthon) yielded a disturbed argon release spectrum with a minimum age of ca. 575 Ma at high temperature increments of the experiment.

Samples with well-preserved high-T deformational fabrics within the Danubian, Getic and Supragetic nappe complexes display internally concordant release spectra with well-developed plateau which record only minor (c. 5 –10%) radiogenic argon loss during Alpine events (see Figure 1 for hornblende release spectra). Plateau ages of hornblende include (Fig. 1): 316.7±0.6, 319.3±0.5 and 322.6±0.5 Ma (Getic nappe complex); 317.0±0.8 Ma in the Supragetic nappe complex. Plateau ages of muscovites include: 296.0±0.2 Ma (Danubian "parautochthon"); 309.5±0.5, 299.4±0.5 Ma, and 300.8±0.5 Ma (Getic nappe complex); 307.4±0.4, 294.6±0.5, 301.8±0.4 Ma (Supragetic nappe complex). The age of Alpine tectonothermal activity is not clearly resolved in the release spectra. An apparantly older thermal event (c. 200 Ma) may be recorded by internally discordant release spectra which characterize muscovite concentrates from Getic basement within the Bahna klippe. The age of Alpine tectonothermal activity is constrained by whole-rock phyllite plateau ages of 117.9±0.2 Ma and 118.6±0.3 Ma from Carboniferous sequences along the Supragetic/Getic nappe boundary.

The $^{40}Ar/^{39}Ar$ results indicate only minor record on a pre-Variscan, Cadomian orogenic activity, and a similar "late" Variscan age for the high-temperature tectonothermal overprint within the basement rocks in all major basement units in the Southern Carpathians. These data record slow cooling within a ca.15 Ma time interval from c. 500° to c. 350° following the last penetrative deformation. Cooling and uplift was obviously linked to contemporaneous deposition of Late Carboniferous overstep sequences on the basement in the Southern Carpathians. The apparent 200 Ma-age event may represent a rifting event at the Triassic/Jurassic boundary within the former Variscan orogen. Ages of c.118 Ma are interpreted to date the onset of Alpine thrusting along the Supragetic/Getic nappe boundary (early Cretaceous), and suggests footwall propagation of thrust during maintenance of very low grade to low-grade metamorphic conditions.