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

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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.

The Late Variscan cooling ages indicate that South Carpathians units were accreted onto a Cadomian belt of central to eastern Europe in a last step of plate collision between Gondwana and Northern Europe.

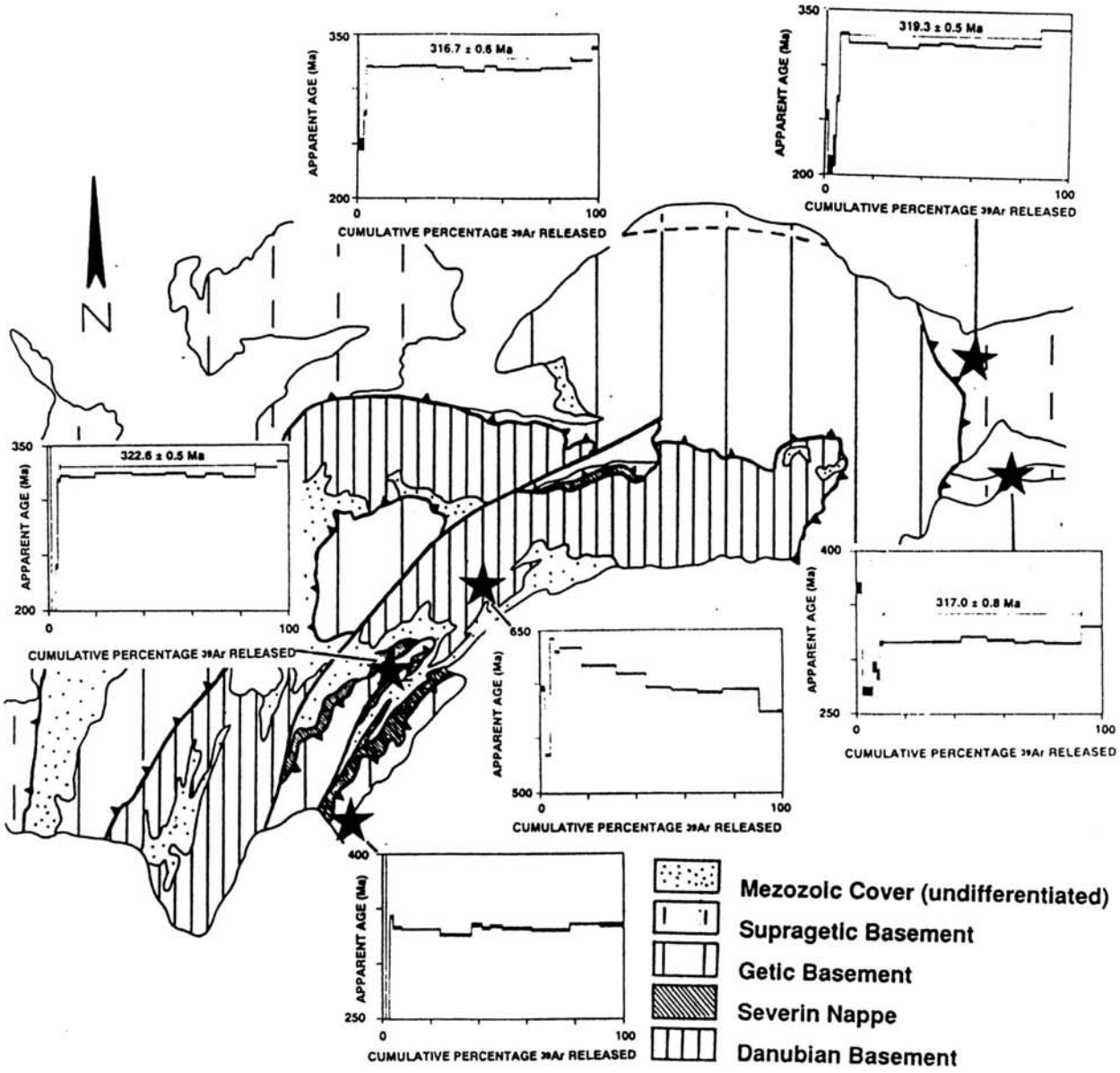

Fig. 1: Simplified geological map of the Southern Carpathians with argon release spectra of hornblende concentrates.