THE VARISCAN GRANITES OF CENTRAL EUROPE: TYPOLOGY, SOURCES AND TECTONIC SETTING

F. FINGER

Institut für Mineralogie der Universität Salzburg, Hellbrunnerstraße 34, A–5020 Salzburg

Compared with other collision orogens (e.g. Alps, Himalaya, Caledonides), the Variscan fold belt appears to be extraordinary rich in late– to postorogenic granitic rocks. Most of these "Variscan granites" crop out in the highly metamorphic Moldanubian core region (Fig.1), where they form several batholithic complexes, that postdate collisional regional metamorphism by ca. 20–30 Ma (Von Quadt and Finger 1991, Friedl et al.1993).

However, post–collision granitoids of about the same Upper Carboniferous age are also very abundant in the basement of the Alpine–Carpathian chain. Most of these intraAlpine Variscan granitoids are metaluminous to weaky peraluminous granodiorites and tonalites with trace element and isotopic signatures of volcanic arc magmatism (Petrik and Broska 1992, Finger and Steyrer 1990). This may indicate a late Paleozoic northward subduction of the Paleotethys ocean along the southern flank of the Variscan fold belt. Such subduction processes could have occurred in conjunction with the marked late Variscan dextral strike–slip movements between Gondwana and Laurasia (Finger and Steyrer 1991). On the other hand, the **intra–Alpine Variscan granitoids** may have received their I–type characteristics simply through remagmatization of older arc–type crust in a (non–

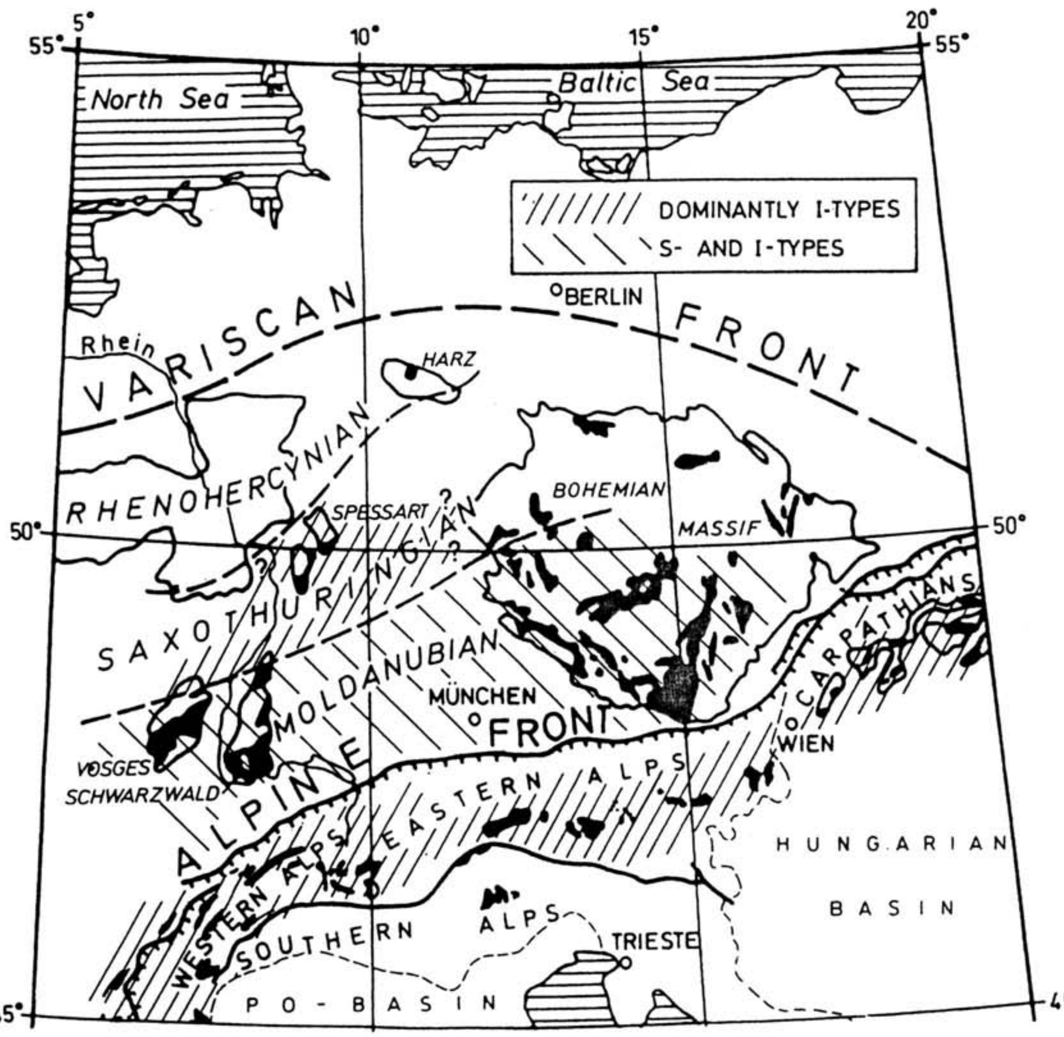

Fig. 1: Distribution of late Paleozoic (=Variscan) granitoids in central Europe (slightly modified after Finger and Steyrer 1990). There are three major magmatic zones: a belt of Upper Carboniferous I–type granitoids in the Alps, an about coeval I–type plus S–type granitoid belt in the Moldanubian (late Visean to Namurian) and a northern belt of somewhat older, late–Devonian to early Carboniferous volcanic–arc–type plutons in the Saxothuringian.

subductionrelated) post–collisional high heat–flow regime (Vavra 1989).

Southward subduction of oceanic domains in the northern Variscan realm was probably responsible for the formation of some **volcanic–arc–type plutons in the Saxothuringian** (e.g. Odenwald - Liew and Hofmann 1988, Henes–Klaiber and Altherr 1991). These plutons intruded between ca. 360 and 330 Ma (Kirsch et al. 1988) and are older than the intra–Alpine I–type granitoids. Late Devonian to early Carboniferous diorites/tonalites/granodiorites in the northern Vosges (Holl and Altherr 1987) and in central Bohemia (Košler and Aftalion 1992) may be combined with the Odenwald to a northern, pre– or early–collisional subduction related plutonic belt.

The **post–collisional batholiths of the Moldanubian zone** consist mainly of granites and granodiorites, that range chemically from I–type to S–type. The abundant S–type granitoids may be explained in terms of melting of metasedimentary Moldanubian crust at low to moderate pressures (Liew et al.1989, Clemens and Finger 1994).

The Moldanubian I–type granitoids are mostly significantly lower in CaO and higher in K_2O than I–type granitoids of active continental margins (Liew et al. 1989). Some of them, e.g. the Weinsberg granite of the Southern Bohemian Batholith, originated from dry melting of lower crust due to breakdown reactions of biotite (Clemens and Vielzeuf 1987, Clemens and Finger 1994). Others, e.g. the "Schlierengranite" of the Southern Bohemian Batholith (Finger 1985, Frasl and Finger 1991), were probably produced by water–present anatexis of orthogneisses at mid crustal levels (Clemens and Finger 1994). Minor volumes of Moldanubian I–type granitoids (e.g. the "Durbachites") might be derived from basaltic magmas contaminated in the lower crust by an AFC process (Propach 1977, Holub 1991, Wenzel et al. 1991).

The extended late Visean crustal anatexis in the Moldanubian unit most likely requires mantle magmatism (magmatic underplating) as a heat source. This mantle magmatism may be related to subduction of oceanic crust from the south (Finger and Steyrer 1991) combined with decompressional mantle melting due to the post–collisional collapse of the Variscan orogen.

A–type granites, i.e. leucocratic granites high in HFSE, which commonly mark the transition from orogenic to anorogenic environments, are rarely found in the Moldanubian unit (e. g. Homolka type in Czechia - Matějka and Klečka 1992), but seem to be quite abundant in the intra–Alpine domain, where they form small Permian intrusions within the Carboniferous I–type granitoid complexes (Vavra 1989, Haunschmid et al. 1991). This suggests A–type granite formation by high–temperature melting of restitic I–type sources (Collins et al. 1982, Clemens 1986). Permian A–type granites also occur in some places in the northern half of the Variscan fold belt (Harz, Erzgebirge - see e.g. Liew and Hofmann 1988).

THE VARISCAN OROGEN IN CENTRAL EUROPE: STILL MORE QUESTIONS THAN ANSWERS

W. FRANKE

Institut für Geowissenschaften und Lithosphärenforschung, Justus Liebig Universität Senckenbergstr. 3, D - 35 390 Gießen, Germany

The Variscan belt of Europe is a terrane collage of Gondwana–derived microplates, set between Laurentia–Baltica to the north and the Gondwana mainland to the south. These microplates became separated from each other during an important rifting episode in CambroOrdovician time. The resulting areas of oceanic and/or thinned continental crust were consumed by subduction during a Silurian to Carboniferous period of plate convergence, which produced a number of individual thrust belts and sutures. Subduction was directed to the south on the northern flank (Rheno–Hercynian and Saxo–Thuringian belts), and to the north on the southern flank (Moldanubian belt). During and after the collision, the sutures were overprinted by dextral wrench faulting, and the internal parts of the collage were welded together by lowpressure/high–temperature metamorphism, followed by moderate post–orogenic extension and magmatism in the Permo–Carboniferous. So far so good, **BUT:**

The **plate–kinematic framework** is far from being completely understood. This is partly due to different methods and scales of observation. For example, palaeogmagnetism and biogeography suggest an Ordovician ("Rheic") ocean separating Avalonia from Armorica represented by a suture between the Rhenohercynian belt and the Mid–German Crystalline High, but field evidence is meagre: scraps of Silurian calc–alkaline rocks in the Northern Phyllite Zone and the Mid–German Crystalline High possibly represent an island arc relating to the closure of the Rheic. On the other hand,