THE Sr – Nd ISOTOPE GEOCHEMISTRY OF THE CENTRAL BOHEMIAN PLUTON, CZECH REPUBLIC

V. JANOUŠEK[1] & G. ROGERS[2]

[1] *Department of Geology and Applied Geology, University of Glasgow, Glasgow G 12 8QQ, Scotland*

[2] *Scottish Universites Research & Reactor Centre, East Kilbride, Glasgow G75 0QU, Scotland*

The present contribution deals with the isotopic composition of selected granitoid types of the Hercynian Central Bohemian Pluton *(CBP)*, which has intruded the boundary between the Teplá–Barrandian and Moldanubian zones. The Blatná granodiorite of the CBP has previously been dated at 331 Ma *(van Breemen et al.,1982)*, and this date has been used to age–correct all the isotopic data reported in this study.

On an $(^{87}Sr/^{86}Sr)_i$ – ε^{i}_{Nd} diagram all the samples, including those of the Blatná granodiorite *(van Breemen et al.,1982 ; Košler, 1993)* form a shallow dipping trend, with $(^{87}Sr/^{86}Sr)_i$varying between 0.7073 to 0.7129 and ε^{i}_{Nd} from –3.4 to –8.9. Such a trend is strikingly similar to that reported for other granitoids throughout the Hercynian belt *(e.g. Liew et al., 1989; Pin und Duthou, 1990)*. None of the rocks analysed has positive ε^{i}_{Nd} values, in contrast with some of the early Hercynian orthogneisses in mantle of the CBP *(Košler, 1993)*. Individual granitoid types from the CBP, however, show distinct Sr and Nd isotopic signatures.

The lowest $(^{87}Sr/^{87}Sr)_i$ and highest ε^{i}_{Nd} values are shown by the hornblende–biotite granodiorites of the Kozárovice intrusion and the Lučkovice monzogabbro: 0.7073 – 0.7083 and –3.4 to –5.3 respectively. The slight variability in the isotopic composition of the Kozárovice granodiorite could be explained by limited country rock contamination; as is clearly seen in the field, many xenoliths of country ŕock are partly digested by the granodiorite, which, in the most advanced stage, form hornblende – biotite schlieren.

The late porphyritic muscovite–biotite Říčany granite has significantly higher $(^{87}Sr/^{86}Sr)_i$ (0.7102 – 0.7108) and lower ε^{i}_{Nd} values (–6.8 to –7.7) than either the Kozárovice or Blatná intrusions. The trace element and isotopic data can be explained by biotite and K–feldspar dominated fractionation coupled with limited amounts of crustal contamination. The Nd isotope composition of a mafic microgranular enclave within the Říčany granite (ε^{i}_{Nd} = –8.9) shows disequilibrium with its host (ε^{i}_{Nd} = –7.4), whereas its initial Sr isotope ratio is in equilibrium ($^{87}Sr/^{86}Sr$ = 0.7106).

The most evolved Sr – Nd isotopic compositions are from samples of the K–rich hornblende-biotite Sedlčany granite $(^{87}Sr/^{86}Sr)_i$ = 0.7126 – 0.7128; ε^{i}_{Nd} = –7.2 to –7.8). A minette from Kožlí also has a high initial Sr isotope ratio of 0.7129 and an ε^{i}_{Nd} value of –7.2 similar to those shown by the Sedlčany intrusion. For the minette, such an isotopic composition is unlikely to have been attained by contamination at the present erosion level, as the surrounding Blatná granodiorite has a significantly lower $(^{87}Sr/^{86}Sr)_i$ value. It is possible that the isotopic composition of the minette reflects that of an enriched lithospheric mantle source such as has been suggested elsewhere in the Hercynian belt *(Turpin et al. 1988)*. If this is the case, then the isotopic composition of the Sedlčany granite may also be dominated by such a source. Alternatively, the Sedlčany granite may reflect more extensive crustal contamination processes operating on less enriched mantle–derived melts.

The two–stage Nd depleted mantle model ages of the CBP are very uniform, increasing from the Kozárovice type (T_{DM} = 1.4 Ga) to the Říčany and Sedlčany types (T_{DM} = 1.6 Ga), representing typical 'Hercynian' values *(Liew and Hofmann,1988)*.

Overall, the earlier intrusions of the CBP show lower initial Sr and higher initial Nd isotopic ratios than the later ones. Although this isotopic trend could be explained in terms of a progressive increase in crustal contamination with time, the major and trace element geochemistry of the intrusions suggest that different sources are being tapped by each intrusion, especially the later bodies.The lack of the positive ε^{i}_{Nd} values throughout the CBP suggests very limited involvement of a depleted mantle component in the petrogenesis of the studied rocks.

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TECTONIC MAP OF PRE–MESOZOIC TERRANES IN THE CIRCUMATLANTIC PALEOZOIC OROGENS

J.D. KEPPIE[1], R.D. DALLMEYER[2]

[1] *Department of Mines and Energy, P.O. Box 1087, Halifax, Nova Scotia, Canada*

[2] *Department of Geology, University of Georgia, Athens, Georgia, U.S.A.*

This c.1:5,000,000 map predicts Precambrian–Paleozoic terranes within circum–Atlantic Paleozoic orogens on a Permian palinspastic reconstruction (a closed Atlantic Ocean). The base map is a transverse Mercator projection with the Equator parallel to the long axis of the closed Atlantic. Different terranes have been identified on the basis of their age and tectonic setting. Several categories have been defined. These include: autochthonous and imbricated basement/miogeoclines, continental rises, oceanic lithosphere, oceanic sequences, magmatic arc complexes, periarc basins, trench complexes, disrupted terranes (tectonic melanges), metamorphic rocks with uncertain affinities, continental rocks with uncertain affitinies, and rifted continental rocks with uncertain affitinities. Post–accretionary cross–cutting plutons, overstep sequences, and accretionary diagrams are also shown.

The major cratonic terranes and associated miogeoclinal sequences around the margins of the circum–Atlantic Paleozoic orogens are structurally separated from magmatic arc and oceanic terranes, which occur in internal and structually uppermost parts of the various orogens. Disrupted terranes, maining comprised of ophiolitic material, oceanic and periarc rocks within a foliated matrix of miogeoclinal and continental rise affinites, generally occur along the margins of the major cratonic terranes. Precambrian rocks within the major cratonic terranes bordering the circum–Atlantic Paleozoic orogens display a wide range of age, including: Archean, Early Proterozoic and Middle Proterozoic (Grenvillian). These occur in Baltica, Laurentian and South American. Grenvillian–age basement is absent in northwest Africa. Continental terranes with Archean–Proterozoic basement are distributed throughout the circum–Atlantic cratonic terranes; as a result, basement age is in itself not a unique criteria for terrane definition and establishment of kinship. Late Precambrian terranes are limited to southeastern sectors of the map, including areas of western Europe, the British Isles, southeastern Appalachians, northwest Africa, and northern South American. These were accreted during Late Proterozoic – Early Paleozoic orogenic activity. These latter orogens developed within Precambrian rocks ranging in age from Archean to Middle Proterozoic. Their accretional activity overlapped the time span for the opening of Iapteus, and they likely originated in palinspatically separated oceanic realms. Magmatic arcs and periarc teranes are preserved in several Late Precambrian – Early Paleozoic orogens. This constrasts with their poor preservation in Paleozoic orogens. Because magmatic arcs are typically situated in upper plate structural positions, they would be expected to have been largely removed as a result of erosional processes operative following continental collision. Therefore, their preservation within the Late Precambrian – Early Paleozoic orogens suggests that such collisions likely did occur. Overstep sequences across Late Precambrian terranes locally developed into miogenoclines setting relative to the Paleozoic orogens.

Most of the Paleozoic, ophiolitic, magmatic arc and oceanic terranes in the circum–Atlantic Paleozoic orogens appear to have develped largely during the Cambrian–Ordovican, with relatively few terranes of Silurian–Carboniferous age. These are largely confined to western and central Europe. This suggest that Iapetus was esentially closed by the end of the Early Paleozoic. This is supported by the presence of distinct faunal provinces during the Cambrian–Ordovician. This was followed by establishment of cosmopolitan Silurian–Devonian fauna. Late Paleozoic orogenic activity was mainly of transpressive character along the vestiges of Iapetus. Convergence occurred within most Variscan orogenic settings. The scale of Late Paleozoic transcurrent and rotational movements are uncertain. Several widely divergent models have been proposed on the basis of contrasting paleomagnetic results.