PB–PB AND U–PB ZIRCON AGES AND ND ISOTOPIC SYSTEMATICS FOR METAMORPHIC ROCKS FROM THE GÓRY SOWIE BLOCK, WEST SUDETES, POLAND, AND GEODYNAMIC SIGNIFICANCE

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The Góry Sowie Block (GSB) is a fault–bounded gneiss complex in the West–Sudetes consisting of supracrustal and plutonic rocks which were subjected to multiphase deformation and high–grade metamorphism (1). The complex also contains three small occurrences of felsic granulites whose precise relationship to the surrounding rocks remains uncertain (2). The supracrustal rocks, predominantly semipelites and psammites, are considered to be of late Proterozoic age, and many of the quartzofeldspathic gneisses and migmatites resulting from amphibolite–grade metamorphism are considered to be derived from this assemblage (1). Mid–Devonian U–Pb zircon and monazite as well as Rb–Sr mineral ages ranging from 360–380 Ma for one of these gneisses are interpreted to reflect cooling after the peak of regional metamorphism (3). Single zircons from a granite sheet cutting migmatized sillimanite gneiss suggest an age of ~460 Ma (4). We have undertaken Pb–Pb and U–Pb dating of single zircons or small zircon fractions from a variety of the gneisses and granulites in order to constrain the age of formation of these rocks and their metamorphism. This is complemented by εNd–values and depleted mantle model ages.

Many of the augen– and flaser–gneisses previously considered to be derived from greywacke–type sediments are, in fact, granitoid orthogneisses with magmatic zircon populations, and their chemistry classifies them as calc–alkaline intrusives with a volcanic arc signature. The primitive nature of these rocks is supported by eNd–values around 0. Zircons from the best preserved gneisses have crystallization ages of 482–487 Ma which we consider to reflect the time of granitoid magmatism. Migmatitic orthogneisses fall into the same age range and contain quartzofeldspathic mobilisates with zircon ages of 474±7 and 440±7 Ma respectively, suggesting an Ordovician high–grade metamorphic event. Several orthogneisses and migmatites also contain zircon xenocrysts as old as 2675 Ma. Metamorphic zircons from one sample of felsic granulite are nearly concordant and yielded a U–Pb Concordia intercept age of 404±3 Ma while detrital zircons from granulitic paragneisses yielded ages between 512±13 and 1618±21 Ma. Two undeformed granitoids cutting the above rocks yielded single zircon Pb–Pb ages of 334±6 and 332±9 Ma repectively and are thus clearly of late Variscan origin.

The eNd values for the granitoid gneisses and migmatites range from –6 to 0 which, together with the zircon xenocrysts, attest to the involvement of variable proportions of ancient continental crust in the generation of their granitoid precursors.

Our data are in good agreement with zircon ages between 461 and 504 Ma for granitoid rocks recently reported from the West Sudetes (4) and farther SE and suggest the presence of a major active continental margin in the Ordovician along the eastern margin of the Bohemian Massif. There is no evidence for a late Proterozoic (Cadomian) event in the region.

References

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