mapa geologiczna Sudetów 1:25,000, Arkusz Międzygórze. Wydawnictwa Geologiczne, Warszawa.
HAMMARSTROM J.M. and ZEN E-An., 1986. Alumimium in hornblende: an empirical igneous barometer. *Am. Miner.*, 71: 1297-1313.
HOINKES G., 1986. Effect of grossular-content in garnet on the partitioning of Fe and Mg between garnet and biotite. *Contrib. Mineral. Petrol.*, 92: 393-399.
HOLLAND T. and BLUNDY J., 1994. Non-ideal interactions in calcic amphiboles and their bearing on amphibole-plagioclase thermometry. *Contrib. Mineral. Petrol.*, 116: 433-447.
HOLLISTER L.S., GRISSOM G.C., PETERS E.K., STOWELL H.H. and SISSON V.B., 1987. Confirmation of the empirical correlation of Al in hormblende with pressure ofsolidification od calc-alkaline plutons. *Am. Miner.*, 72: 231-239.
MASONNE H-J. and SCHREYER W., 1987. Phengite geobarometry based on the limiting assemblage with K-feldspar, phlogopite, and quartz. *Contrib. Mineral. Petrol.*, 96: 212-224.
SMULIKOWSKI K., 1967. Eklogity Gór Śnieżnickich w Sudetach. *Geol. Sudetica*, 3: 7-180.
STAWIKOWSKI W., 2001. Strefy kontaktowe eklogitów i gnejsów w jednostkach Gierałtowa i Śnieżnika (kopuła orlicko-śnieżnicka). *Przegląd Geologiczny*, 49: 153-160.
STELTENPOHL M.G., CYMERMAN Z., KROGH E.J. and KUNK M.J., 1993. Exhumation of eclogitized continental basement during Variscan lithospheric delamination and gravitational collapse. *Geology*, 21 :1111-1114.
ŻELAŹNIEWICZ A. and BAKUN-CZUBAROW N., 2002. A polyphase exhumation of the ultra-high-P eclogites from Nowa Wieś in the Międzygórze unit, the Sudetes. *Geolines*, this volume.

Geochronology of Mid-Devonian Clastic Sediments in the Barrandian, Bohemian Massif

Ladislav STRNAD[1] and Jan KOŠLER[1] and Vojtěch JANOUŠEK[2]

[1] *Institute of Geochemistry, Mineralogy and Mineral Resources, Charles University, Albertov 6, 128 43 Praha 2, Czech Republic*

[2] *Czech Geological Survey, Klárov 3, 118 21 Prague 1, Czech Republic*

The deposition of Givetian siliciclastic turbidites and calciturbidites in the Teplá-Barrandian Zone in Central Bohemia is often interpreted as resulting from an early stage of Variscan orogeny (Kukal and Jager, 1988; Strnad and Hladil, 2001). The sediments contain variable amounts detrital silicate minerals and carbonate component. K-Ar age of detrital muscovites in this formation is ca 490 Ma (Ahrendt et al., 1998), however ages and source of other detrital components have not been previously studied. Clastic minerals include mostly angular and subangular grains of quartz and alkali feldspar. Biofragments such as spicules of sponges, radiolaria, dacryoconarids and other non-identified calcareous organic detritus are also present. Illite crystallinity (Ahrendt et al., 1998) and optical microscope study suggest that the mid-Devonian clastic sediments experienced only a weak diagenetic transformation. The heavy mineral assemblage recovered from six sediment samples consists of several size, shape and colour populations of garnet and zircon, pyroxene, tourmaline, apatite, hornblende, leukoxene and Fe-sulphides. Size of zircon grains does not usually exceed 200 microns. Rounded elongate and spherical zircons are present in all studied samples and often show extensive mechanical abrasion, idiomorphic crystals are less common. The U-Pb isotopic system in zircons hence represents an ideal tool to study the provenance of the Givetian sediments in the Barrandian.

The U-Pb and Pb-Pb laser ablation ICP MS isotopic data from studied detrital zircons indicate that the source area included Archean to early Palaeozoic rocks with ages between 3.0–0.4 Ga. The secondary and backscattered electron images of zircons suggest that the Archean (3.0 and 2.6 Ga) and early Proterozoic ages (2.2–2.0 Ga) represent a strongly reworked and recycled Gondwana material. Detrital zircons of Grenvillian age (ca 1.65 Ga) are scarce in the studied sediments. The late Proterozoic – early.

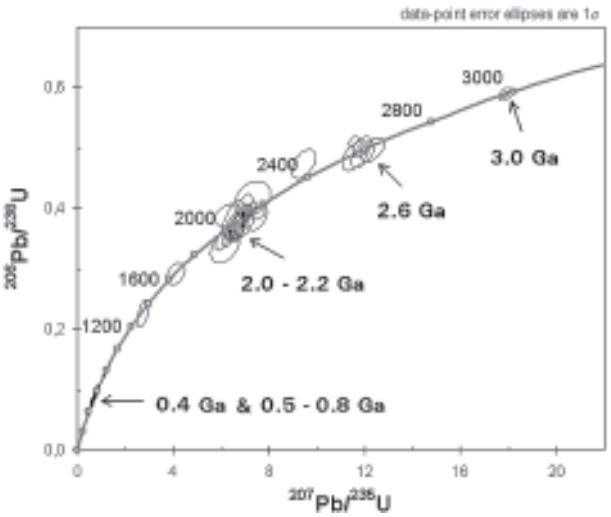

Fig. 1. U-Pb Concordia plot of detrital zircon analyses from samples of Barrandian Mid-Devonian sediments.

Palaeozoic (Pan-African) ages between 800–550 Ma correspond to zircons with variable shapes and internal zoning. The c. 600 Ma zircon data may correspond to ages on granitic magmatism, the relics of which are also found in the Cambrian and Neoproterozoic conglomerates (Dörr et al., 1992). The late Cambrian ages of ca 500 Ma correspond to idiomorphic elongate zircons crystals such as are found in magmatic and metamorphic rocks along the south-western margin of the Teplá-Barrandian (Bowes and Aftalion, 1991; Zulauf et al., 1997; Dörr et al., 1998). This may suggest that in the Mid-Devonian times a significant amount of material was transported to the Barrandian basin from the south and southwest. The youngest identified zircons so far yielded Lower Devonian ages.

Six analysed whole rock samples from the Srbsko formation gave identical mean crustal residence Nd single stage model ages, suggesting that the source rocks of the sediments were derived from a depleted mantle at ca 1.6 Ga, i.e. similar to the Nd model ages for Barrandian Proterozoic graywackes (1.6–1.8 Ga; Janoušek and Vokurka 1998). Collectively, our U-Pb zircon and Nd whole-rock data suggest that the studied Givetian sediments were mostly derived from Proterozoic rock sequences, with contribution of Cambro-Ordovician magmatic rocks. Significant contribution of Devonian magmatic and metamorphic rocks still remains unclear.

References:

AHRENDT A., WEMMER K. and NEUROTH H., 1998. K-Ar systematics on detrital white micas and fine mineral fractions from the Barrandian of the Prague syncline/Czech Republic. *Acta Universitatis Carolinae – Geologica*, 42 (2): 204.

BOWES D.R. and AFTALION M., 1991. U-Pb zircon isotopic evidence for early Ordovician and late Proterozoic units in the Mariánské Lázně complex, Central European Hercynides. *N.Jb.Miner.Mh.*, 7: 315-326.

CHÁB J., JANOUŠEK V. and VOKURKA K., 1998. Geochemie neoproterozoických drob a metadrob Bohemika. Czech Geological Survey, unpublished report.

DÖRR W., FISERA M. and FRANKE W., 1992. Cadomian magmatic events in the Bohemian Massif - U-Pb data from felsic magmatic pebbles. -In: 7th Geological Workshop – "Styles of superposed Variscan nappe tectonics", Conf. Abstr., Kutná Hora 24-27 April 1992, ČSFR.

DÖRR W., FIALA J., VEJNAR Z. and ZULAUF G., 1998. U-Pb zircon ages and structural development of metagranitoids of the Teplá crystalline complex: evidence for pervasive Cambrian plutonism within the Bohemian massif (Czech Republic). *Geol. Rundsch*, 87: 135-149.

KUKAL Z. and JÄGER O., 1988. Siliciclastic signal of the Variscan orogenesis; Devonian Srbsko Formation of Central Bohemia. *Czech Geol. Surv. Bull.*, 63 (2): 65-80.

STRNAD L. and HLADIL J., 2000. Geochemistry and Composition of the Middle Devonian Srbsko Formation in Barrandian Area, Bohemian Massif: A Trench or Fore-Arc Strike-Slip Basin Fill with Material from Volcanic Arc of Continental Margin? 6th Meeting of the Czech Tectonic Studies Group – Donovaly, Slovakia, *Geolines*, 13: 111-114.

Apatite Fission Track Analyses from the Polish Western Carpathians

A. A. STRUZIK[1], M. ZATTIN[2] and R. ANCZKIEWICZ[3]

[1] *Institute of Geological Sciences, Polish Academy of Sciences, Senacka 1, 30-002 Kraków, Poland*
[2] *University of Bologna, Dipartimento di Scienze della Terra e Geologico-Ambientali, via Zamboni, 40126 Bologna, Italy*
[3] *University College London, Department of Geological Sciences, Gower Street, WC 1E 6BT London, United Kingdom*

Introduction

The Polish Western Carpathians (PWC) form the northernmost part of the Carpathian belt, which belongs to the Alpine-Carpathian orogenic system (Fig. 1). The PWC are subdivided into two main tectonic units: 1) The Inner Carpathians (IC), interpreted as representing the Southern (Apulian) margin of the Tethyan ocean and 2) The Outer Carpathians (OC) composed of turbiditic sequences (Fig. 2) developed on the northern margin of the Tethys, which are commonly correlated with the Alpine flysch (e.g., Csontos et al., 1992). The OC flysch sequences were thrust towards NNE during early-middle Miocene forming a nappe stack (Żytko, 1999), (Fig. 2). The IC and the OC are separated by the narrow Pieniny Klippen Belt (PKB), which comprises dominantly strongly deformed carbonates. Between PKB and the Tatra Mts. an intra-mountain Podhale basin developed, which contains Paleogene flysch deposits (Fig. 2).

In order to constrain exhumation history of the PWC and to estimate the effects of Neogene thrusting on the thermal structure of the OC, we performed apatite fission track analyses (AFT) on major tectonic units along Kraków – Zakopane section (Fig. 2). Our preliminary results are presented below.

Results

Seven samples were analysed from the crystaline rocks of the Tatra Mts, which represent the IC unit. Our results are broadly similar to those obtained by Burchart (1972). Three samples from the High (eastern) Tatra (T5-T7) yielded nearly identical ages of c. 11 Ma (Fig. 1), while other three, from the Western Tatra (T1-T3), show a rather wide scatter of ages from c. 12 to 20 Ma. This difference in ages is probably resulting from slightly larger uplift in the High Tatra and some faulting. Track length analyses suggest moderate exhumation rates (Fig. 2).

Fig. 1 Simplified geological map of the Alpine-Carpathian belt (based on Roca et al., 1995). Rectangular marks area shown in Fig. 2.