Foreword – a brief outline of geology of Poland

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This monograph has been edited for the *Eurogranites 2007* workshop that is taking place in Poland for the first time. The area of Poland comprises of various crustal blocks, which have been assembled over geological time (Fig. 1). An overview of the crustal evolution and main magmatic events from Paleoproterozoic to Mesozoic time is briefly given here. The vast problems of the sedimentary sequences and areas are not included.

In general, area of Poland is divided into a several different regions, characterized by different geologic patterns: the north-eastern Poland is connected with the stable Precambrian craton, known as the East European craton (EEC) or Baltica block. The south-western part of Poland, comprising of different Phanerozoic crustal blocks have become successively attached to the ancient Precambrian cratonic nucleus. The boundary between these two main regions is marked by the NW-SE trending Trans-European suture zones (TESZ), which extends over 2000 km from the North Sea to the Black Sea. The TESZ is everywhere concealed beneath Mesozoic and Cenozoic sediments, but it has been well defined by geophysical methods, *e.g.* regional magnetic and gravimetric mapping and deep seismic sounding (the *Polonaise' 97*, *Celebration 2000* profiles).

The Precambrian basement of Poland is covered by younger, sedimentary and volcanogenic, unmetamorphosed sequence of variable thickness, ranging from *ca*. 0.5 km in the NE to 5-8 km along the SW margin of the EEC. In this oldest part of Poland, the geological record of emplacement of magmatic bodies, extend back in time to about 1826 Ma. Therewithal, the main phase of deformation and metamorphism of this part of the EEC is ascribed to the Svecofennian orogeny. However, it seems that the Precambrian crust in Polish area is essentially younger than that in the Svecofennian orogen in the Baltic shield, *i.e.* younger than *ca*. 1.85 Ga. The Late Paleoproterozoic granitoids, drilled on the area are represented by magnesian, mainly *I*-type, alkali-calcic to calc-alkaline monzonites and calc-alkaline orthogneisses of granodioritic composition. Their geochemical features allow to identify a volcanic-arc palaeoenvironment in this part of NE Poland during Late Paleoproterozoic times. Later, the northern part of the present day Poland was affected by post-collisional, anorogenic magmatism of bimodal, silicic and basic composition. The E-W trending shear zones controlled the occurrence of a 200 km long and 40 km wide Mesoproterozoic magmatic unit known as the Mazury complex. It represents a polyphase pluton composed of anorthosite-norite intrusions (*e.g*. Kętrzyn, Suwałki and Sejny massifs) with related ferrolite (Fe-Ti-V bearing) deposits and *A*-type granitoids, such as leucogranite, quartz-monzonite, monzonite, granodiorite, and monzodiorite. The Suwałki anorthosite massif (SAM) and associated rocks belong to the widespread, magmatic AMCG suite (anorthosite-mangerite-charnockite-granite "rapakivi"), related to the Proterozoic deep crustal structures.

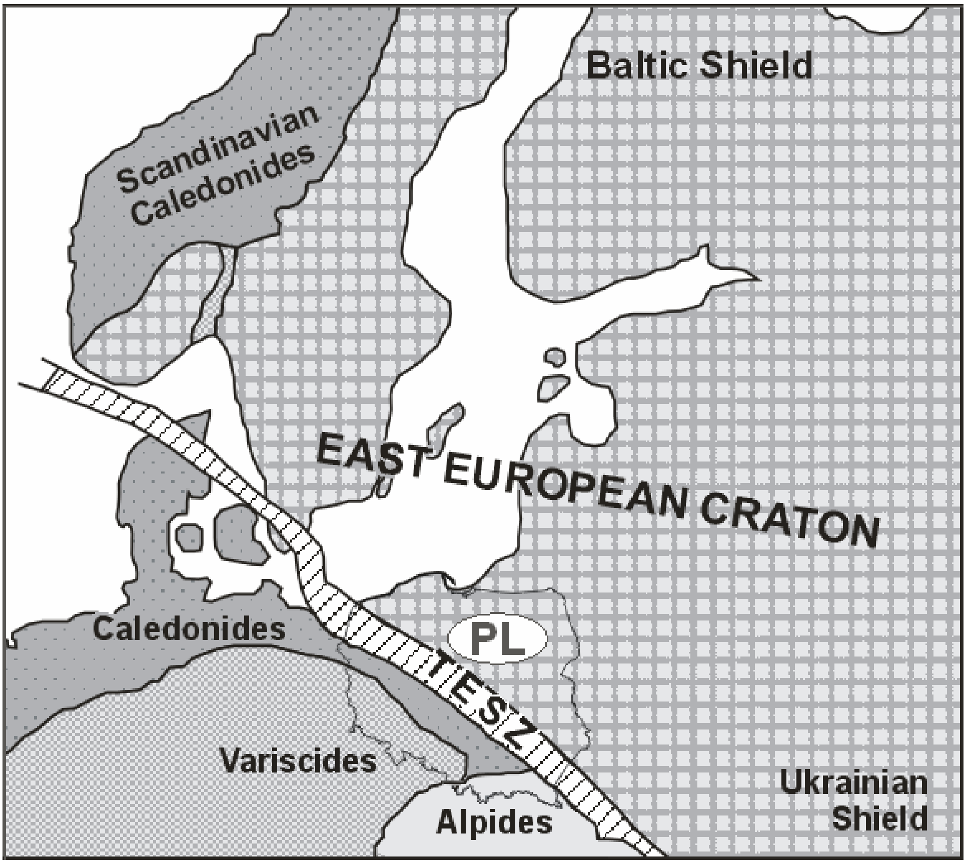

Fig. 1. General tectonic units of the north-central-eastern Europe; TESZ – Trans-European suture zone, PL – Poland.

The next south-western part of Poland is related to the Variscan tectono-stratigraphic units. The Sudetic segment of the Variscides, together with adjacent areas, experienced multi-stage accretion during successive collisional events that occurred between Middle Devonian and Late Carboniferous times and followed closure of various segments of the Rheic Ocean. The main lithostratigraphical components of the Sudetic segment of the Variscan orogen are: (1) Neoproterozoic complexes derived from an active margin of the Gondwana continent and showing a record of magmatism and metamorphism related to the Cadomian (Panafrican) orogeny, (2) widespread Late Cambrian-Early Ordovician granitic intrusions mostly deformed into gneisses due to Variscan tectonism, (3) Ordovician to Devonian volcano-sedimentary basin sequences deposited in a continental rift that evolved into an oceanic basin, (4) a low-grade metamorphosed ophiolitic complexes of probably Late Silurian age, (5) Early/Middle Devonian to Early Carboniferous sedimentary sequences of actively extending continental margins, (6) Carboniferous granitoid massifs and (7) intramontane basins, superposed on (1) through (5) above, that were initiated in the latest Devonian and Early Carboniferous. West and East Sudetes comprise rock units derived from continental margins of the hypothetical Saxothuringian and Brunovistulian microcontinents, respectively, which are accompanied by allochthonous vestiges of intervening marine basins. The components of the tectonic units of Central Sudetes are mostly, if not entirely, allochthonous and contains fragments of a tectonic suture (the Rheic suture), traced by occurrences of (U)HP rocks and ophiolite bodies, that once separated the Variscan terrane assemblage from Laurasia.

The Sudetic Variscan granites comprise of two distinct age groups, dated at *ca*. 340-330 Ma and 320-300 Ma. The generation of older granites, widespread in Central Sudetes and immediately south of the Odra fault zone, took place shortly after the main phase of nappe stacking in the Bohemian massif and might have been facilitated by an increased production of radiogenic heat in the thickened orogenic root. A distinctly younger magmatic event took place in the Sudetes during the ultimate stages of the Variscan orogeny. This Late Carboniferous magmatism shows indicative features of an input of primitive lithospheric mantle probably related to lithospheric extension or delamination.

The southernmost part of Poland is connected with relatively youngest geological crustal forming processes. Exposed along the Polish-Slovakian border, the Tatra Mountains reflect the presence of several crystalline units in the Alpine belt of Central Western Carpathians. It comprises polygenetic Variscan granitoid body that is volumetrically predominant and a pre-Variscan metamorphic envelope. The metamorphic envelope displays an inverted metamorphic zonation, comprised by an upper structural unit (USU) with upper amphibolite facies assemblages overthrusting the lower structural unit (LSU) with upper greenschist to lower amphibolite facies assemblages. The development of the inverted metamorphic zonation was accompanied by shearing and by partial melting resulting in small leucogranite pods and sills, and their pegmatites, in the USU. Two main metamorphic events causing migmatisation took place during Upper Devonian / Lower Carboniferous time.

The elongate composite granitoid body, forming the main part of the massif is characterised by the great variety of petrographic and geochemical features that characterise the individual magma components of this polygenetic intrusion. Various granitoid types, differing also in age, have been distinguished. However biotite and biotite-muscovite granodiorite-granite, in places porphyritic, is the common Tatra type. The granite and granodiorite with abundant phenocrysts of K-feldspars and a strong aligned fabric (Goryczkowa type) occurs only in the so called “crystalline islands” forming the cores of the Alpine Mesozoic nappes which are restricted to the northern part of the massif. The crystalline block of the Tatra Mts. is covered by the Mesozoic sedimentary successions, overthrusted during the Alpine orogenesis from the south to the north. The whole Tatra block was uplifted during Tertiary in several brittle events. The youngest faults and fractures control water and heat circulation until present.

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