Deep crustal structure in SE Poland — new seismic project

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One of the major tectonic problems in Europe concerns the south-western margin of the East European Platform. In general, this margin assumed to be the Tornquist-Teisseyre Zone (TTZ), running across Europe approximately from north-west to south-east. The Polish segment of TTZ is a part of the Trans European Suture Zone (TESZ), a first-order geotectonic unit, stretching from the Black Sea to the British Islands. Determination of deep crustal structure of the contact zone between the Precambrian Platform, the Palaeozoic Platform and Carpathian Mts was the main aim of the deep seismic sounding (DSS) programme in SE Poland in 1965–1982. In the study area the crustal thickness varies, being 48 km within the Precambrian Platform, about 55 km in the TTZ, about 45 km in the Holy Cross Mts and 30–35 km in the Palaeozoic Platform. In the region of the Carpathian Foredeep, it is about 40 km. In the framework of the new programme of deep geological investigations in Poland, closely connected with EUROPROBE Project, there are proposed for the SE Poland and Carpathian Mts new DSS refraction and wide angle reflection profiles SEP1, SEP2, SEP3, SEP4, SEP5, and near vertical reflection profiles SEP1R, SEP2R, SEP4R and SEP5R. The profiles proposed for SE Poland are shown in figure together with the POLONAISE97 Project profiles (P1–P5) which were done in May 1997. In SE Poland, the proposed profiles intersect well known tectonic units and tectonic lines, e.g., the margin of the Precambrian Platform, Holy Cross Fault, Malopolska Massif, Grojec Fault, Krakow-Lubliniec tectonic zone, Upper Silesian Massif and Carpathian Foredeep. The proposed program ought to be correlated with PANCARDI Program in the Carpathian Mts and Pannonian Basin.

Western Carpathian seismic events recorded in Poland

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The paper is based on a new Earthquake Catalogue for the Czech Republic, Poland and Slovakia, compiled in the framework of the Global Seismic Hazard Assessment Program. The catalogue, just under preparation to be published, represents up-dated, revised data set of all earthquakes which occurred prior to 1996. The events have been analyzed basing on source data, wherever it was possible (for all Polish quakes), to determine the epicentral data and their accuracies. Such a work has excluded earthquake duplications, which is a problem when dealing with historical earthquakes. The third level regionalization, based on this catalogue and general tectonic features, delineates Carpathian's region from the Polish — Slovakian frontier area: the Silesian region (11), Carpathian Foredeep (13), and Tatra Mts and Spiš region (14). The Silesian region is located between the Sudetes and Carpathians where the Carpathians are thrust over the Bohemian Massif. Since 1774 seven earthquakes have been recorded, four of them with intensity between 6.5–7.5. This
The seismic activity of the region was exceptionally seismically active in the very short period of two years between 1785–1786. The epicenters of the well documented, strongest events are deep. The size of the shaken areas are relatively large and, consequently, the estimated foci correspond to the lower part of the Earth’s crust. The focal depth of December 3, 1786 earthquake was 40 km.

Carpathian Foredeep — the seismic activity of the region is questionable. The earthquake catalogue includes two events but neither of these with sufficient accuracy. Kraków, in this location experienced a few times during its approximately 1000 year old history, the strong events of the Carpathians and Alps. For example, the vaulting of St. Catherine church in Kraków collapsed in 1443 during the earthquake with its epicenter in Central Slovakia. The evidence of local seismicity has not been confirmed by the seismological stations Kraków (KRA), which was in operation between the years 1954–1990, and Ojców (OJC) since 1990.

The Tatra Mts and Spiš region — the region comprises the most northern part of the Peripienian Lineament. Over the last two centuries, 5 events with intensities 6–7 were recorded in Spiš — Pieniny Mts and in Podhale. The quakes are located along the Peripienian Lineament. The depths of the events calculated from macroseismic data, as well as from instrumental data for events in 1995, are shallow, less than 5 km. In the years 1992–1993 there were recorded seismic events in the Beskid Sadecki Mts, where from seismic shocks are hardly known. There have been recorded two main earthquake sequences. The first one between June 28 and June 30, 1992, consisted of 3 foreshocks and 3 aftershocks. After 8 months, on March 01, there have been recorded 3 shocks: a main shock and two foreshocks. The main quakes of both the series have been widely recorded by European stations. The probabilistic approach to inversion problem was applied to determine the focal parameters together with error ellipses. Macroseismic data have been collected from 70 localities and macroseismic parameters of the two main shocks were determined. The source mechanisms have been calculated for 4 events. Analysis of the recorded seismic events allows to take some general geodynamical conclusions.

Paleolatitude of the South Carpathians during Jurassic and Cretaceous: new results from the Upper Cretaceous and Paleogene of the Hateg Basin, Romania

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The South Carpathians are part of the so called Tisza-Dacia unit which forms the southern part of the Intra-Carpathian area and comprises, beside the South Carpathians, the East Carpathians, the Apuseni Mountains, and the area which is covered by the Tertiary sediments of the Transylvanian Basin. This block is characterized by a common Tertiary tectonic evolution. Geodynamic models and paleomagnetic studies give rise to the assumption of southern position of the South Carpathians relative to Europe during the Mesozoic.

Supported by a grant of the bilateral scientific/technical cooperation between Romania and Germany we started in 1994 to study the paleomagnetism of Jurassic to Cretaceous sedimentary sequences from the South and East Carpathians.

Sampling and subsequent laboratory analysis of Middle Jurassic to Lower Cretaceous sediments from Piatra Craiului and Bucegi Mts (SE Carpathians) shows a common component with steep inclinations. These directions are better grouped for some sites in geographic than in stratigraphic coordinates pointing to a post-tectonic remagnetization which took place just before the Miocene large scale rotations of the Tisza-Dacia unit. Jurassic limestones reveal a paleolatitude of about 18 N. Upper Cretaceous paleolatitudes of 25 from the Banatites and of 28 from the remagnetized Albian Bucegi conglomerates indicate a southern position, at least up to the Late Cretaceous.

During the Maastrichtian to Paleocene, in the Hateg and Rusca Montana area (South Carpathians) continental sedimentary sequences ranging from deltaic to fluvial and alluvial fan facies, were deposited. Stratigraphic sampling of the Sinpetru Beds on the western flank of the Sibisel Valley about 5 km SE of Hateg and close to the southern main fault of the Neogene Hateg Basin were carried out in order to establish a magnetic polarity stratigraphy and to determine the paleolatitude during Maastrichtian and Paleocene times. The laboratory analysis of pilot specimens of each site shows mainly reversed polarity. Normal polarity occurs only in the lowermost part of the section. High resolution stepwise thermal demagnetization up to 675°C reveals preliminary results which indicate about 70° clockwise rotation of the area and inclinations which yield paleolatitudes of about 25–30 N.

The main conclusions are:
— the results are most promising for our magnetostratigraphic approach,
— the Cretaceous collision took place in a coordinate system with north–south striking sutures in the South and East–West striking sutures in the East Carpathians,
— the paleolatitude during Maastrichtian and Paleocene was still about 25–30 N.