Deep Lithosphere Structure along P2 and P4 Profiles
Thermal-Gravity Models

Olga Polechońska, Marta Wróblewska
olga.polechonska@pgi.gov.pl  marta.wroblewska@pgi.gov.pl

Polish Geological Institute
Rakowiecka Str.4, 00-484 Warsaw, Poland

Profile P2 and P4 (project POLONIA/SE activ) run across three major Polish geological units: Paleozoic platform, Torna-European Suture Zone and East European Craton. Since seismic velocity models were constructed (Glebovik, 1998-2000), the next step in the interpretation of these data is potential-field modelling.

Structure of the model bases on the GDS results. 3D modeling using Finite Elements Method was applied.

Gravity models were evaluated using GM-SYS software. On the base of temperature distribution models, a set of blocks was drawn (Fig. 5a and 5b). To each block the average temperature was attributed. Next, blocks were divided into smaller ones, continuously to the seismic models, and velocities attributed to them in the same way as temperatures (Fig. 5a and 5b).

For blocks with velocities between 6.05 and 7.25 km/s densities were evaluated using Soldov and Bailey's formula (1984). While for the upper crust and mantle blocks the formula could not be used, densities were chosen on the base of previous works (Cermak et al., 1989; Cermak, 1995). Density model, there is an increase of densities in this area. It could be an extension of the high velocity body, visible on the TTZ of the contact zone of Paleozoic and Precambrian Platforms in Poland (Tornquist-Teisseyre Zone).

Radiogenic Heat Production (Fig. 3b) is calculated based on the statistical relationship with seismic velocity (Rybach & Burnett, 1984) using the temperature correction (Cermak et al., 1985; Cermak, 1995). Sedimentary cover parameters were applied according to the literature data (Pawlik, 1992; Pnaw, Majowski, 1979) and additional measurements of thermal conductivity of Precambrian rocks from three walls located in the neighborhood of the seismic profiles.

The average thermal conductivity value approximates 2.4 [K/W/m]. Radiogenic heat production 1.2 [W/m²] for sedimentary cover.

Fig. 3a, 4 presents the percentage quota of Radiogenic Heat Production (Qr) in Surface Heat Flow (SHF). Values of Qr on SHF is greater at the Paleozoic platform than at the East European Craton even 50%.

Fig 2 shows broadband filtered Bouguer anomaly map. There is a distinct positive anomaly in the area of TTA profile's high velocity body. It is present only to the NW, crossing P2 profile, but the SE, crossing P4 profile too. Thus it can be presumed that the described body deepens to the SE, and at the P4 profile it is visible only in the lowest part of sedimentary basin (2.77 g/cm³).

References:


