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

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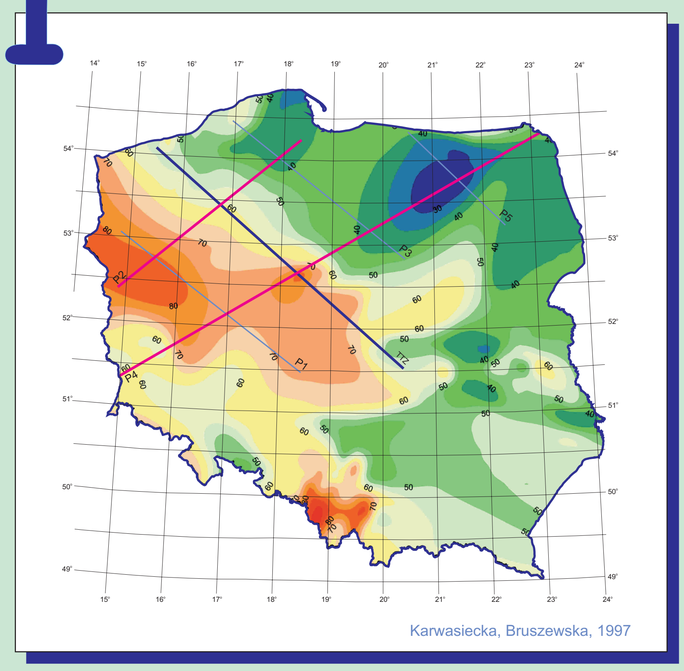

Karwasiecka, Bruszewska, 1997

Profiles P2 and P4 (project POLONAISE'97) run across three major polish geological units: Paleozoic platform, Trans-European Suture Zone and East European Craton. Since seismic velocity models were constructed (Guterch i in., 1986, 2000), the next step in the interpretation of those data is potential fields modelling.

Structure of the model basis at the DDS results . 2D modeling using Finite Elements Method was applied.

Model was meshed to tetragonal elements (PLANE 55, Thermal Solid) size 1km x 1km for narrow layers to 1.4 x 1.4 km for layers with higher thickness. Temperature at the surface is established to 8°C and Heat Flow at the range 15 to 40 mW/m^2 was attributed at the bottom of the model. (**Fig. 3a, 4)** Results were optimized to the Surface Density Heat Flow according to Karwasiecka, Bruszewska (1997) (**Fig. 1**) and temperature at 1km depth (Karwasiecka, 1994). Density of material could be negligible as the analyze was static.

Radiogenic Heat Production (**Fig.3b**) is calculated based on the statistical relationship with seismic velocity (Rybach & Bunterbarth, 1984) using the temperature correction (Cermak et. al, 1989; Cermak, 1995). Sedimentary cover parameters were applied according to the literature data (Plewa, 1992; Plewa, Majorowicz, 1979) and additional measurements of thermal conductivity of Perm and Triassic rocks from three wells located in the neighborhood of the seismic profiles. The average thermal conductivity value approximate to 2.4 [W/m°C] and radiogenic heat production to 1.2 [μW/m^3] for sedimentary cover.

Fig. 3a, 4 presents the percentage quota of Radiogenic Heat Production (Qr) in Surface Heat Flow (SHF). Involve of Qr on SHF is greater at the Paleozoic platform then at the East European Craton even 30%.

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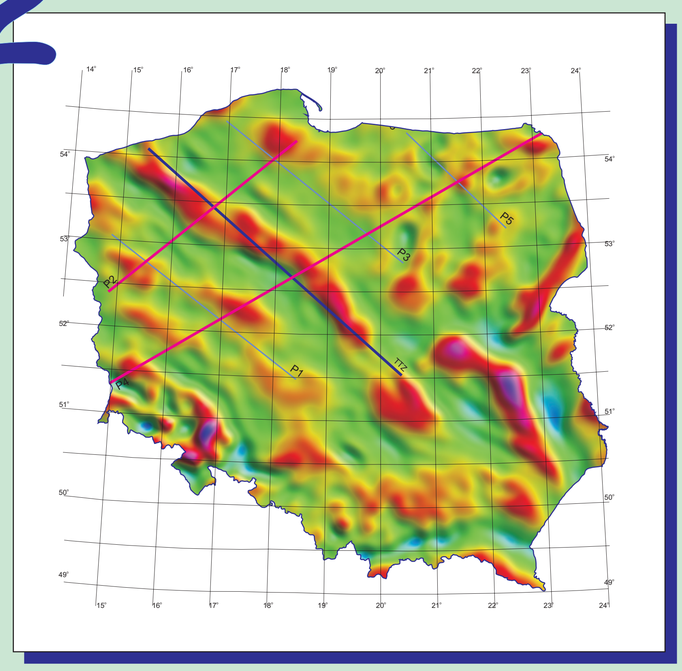

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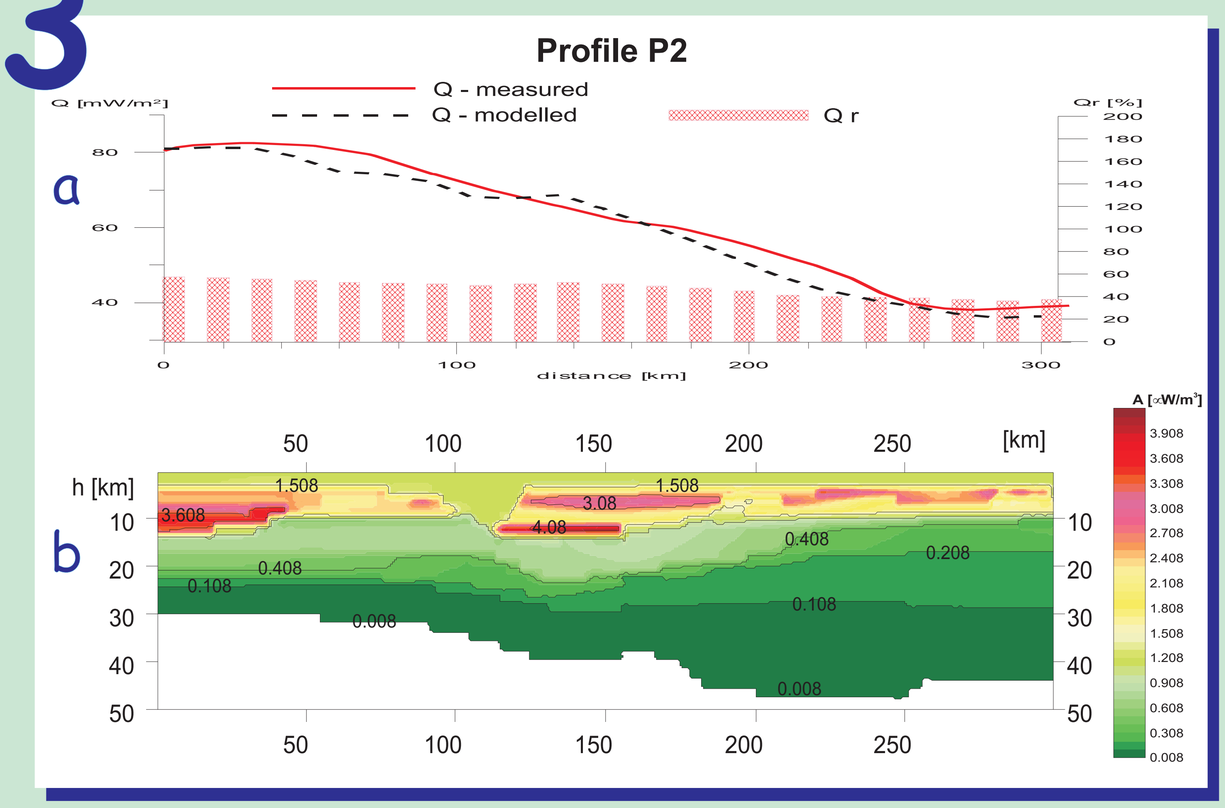

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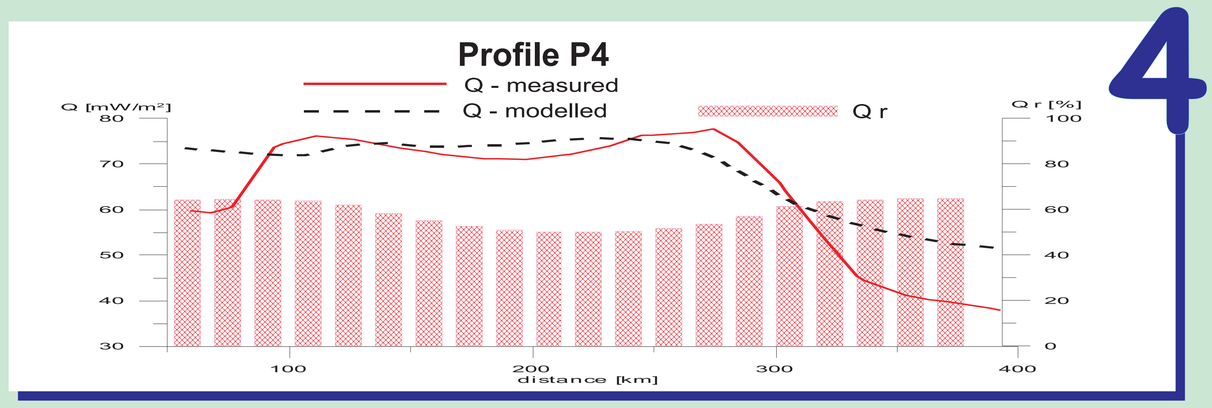

Gravity models were evaluated using GM-SYS software. On the base of temperature distribution models, a set of blocks was drawn (**Fig. 5a and 7a**). To each block the average temperature was attributed. Next, blocks were divided into smaller ones, conformably to the seismic models, and velocities were attributed to them in the same way as temperatures (**fig 5b and 7b**).

For blocks with velocities between 6,05 and 7.95km/s densities were evaluated using Sobolev and Babeyko formula (1994). While for the upper crust and mantle blocks the formula could not be used, densities were chosen on the base of previous works considered petrophysical properties of rocks (Krysiński 2000, Grabowska et al., 1998) and another geological information. The final density model structures are shown of **fig 5c and 7c**. **Fig 5d and 7d** shows the high conformity of modeled curves with the measured values.

Attention should be focused on the velocity decrease of the upper crust in the central part of the profile P2. As it is shown on 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 profile. Lower velocities on P2 profile are an effect of anisotrophy.

Fig.2 shows bandpass filtered Bouguer anomaly map. There is a dinstict positive anomaly in the area of TTZ-profile's high-velocity body. It is spread not only to the NW, crossing P2 profile, but to the SE, crossing P4 profile too. Thus it can be presumed that the described body deepen to the SE, and at the P4 profile it is visible only in the lowest part of sedimentary basin (2,77 g/cm^3).

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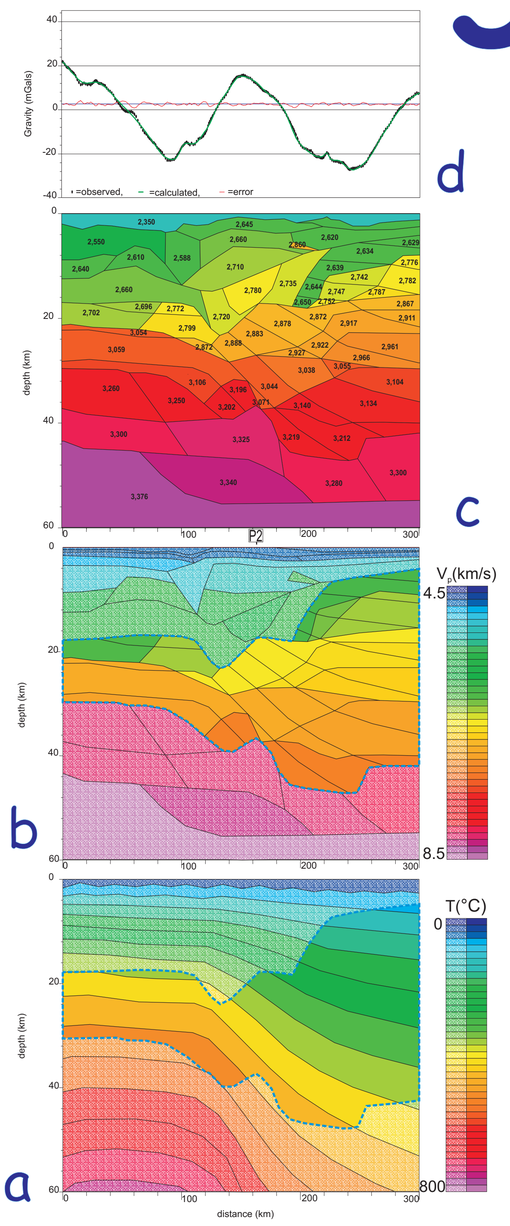

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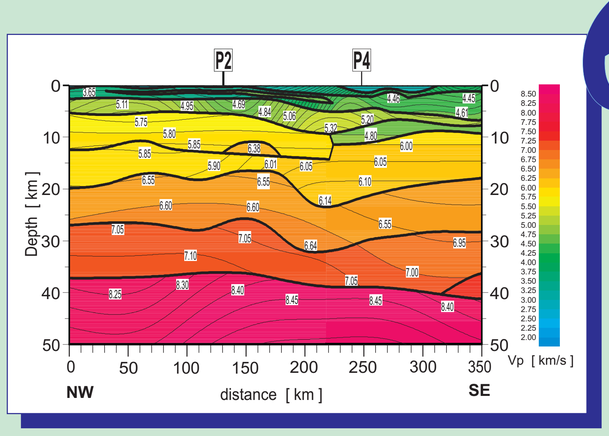

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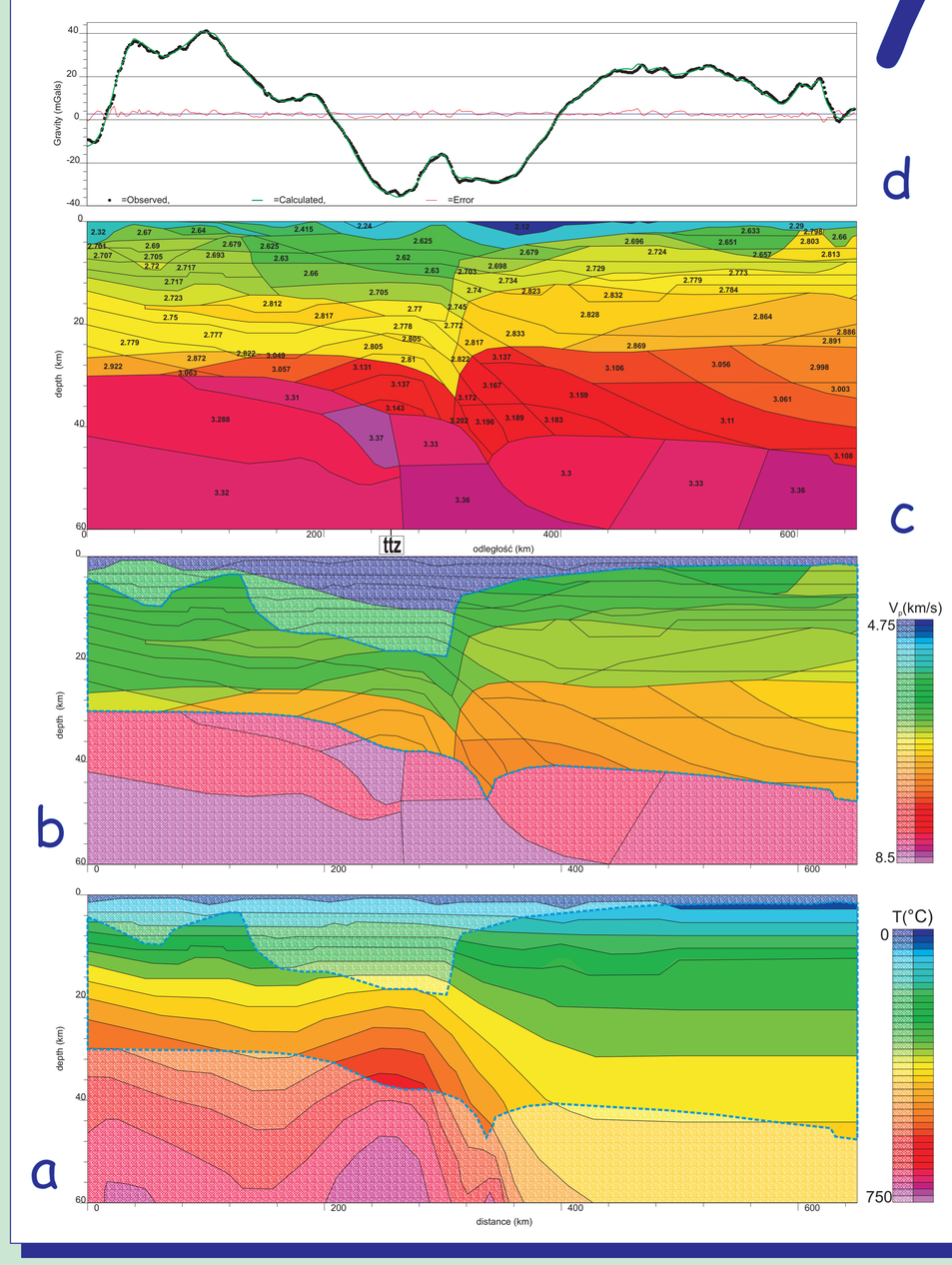

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