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3D density model of the crust and upper mantle for the territory of Poland derived by forward modeling and inversion of gravimetric geoid.

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The wide-angle reflection and refraction seismic experiments performed in Poland in last decade gave us the number of 2D and 3D models of crustal velocities. Precise models of the crust and upper mantle from experiments POLONAISE'97, CELEBRATION 2000 and SUDETES2003 as well as previous profiles LT and TTZ were interpolated into a 3D P-wave velocity model for the whole Poland. The model, parametrized in geographical coordinates system, was converted to density model using different equations connecting seismic velocities to densities for crustal rocks ($5.5<Vp<7.9$), sediments ($Vp<5.5$ km/s) and the uppermost mantle ($Vp>7.9$ km/s). The crustal density model was used to calculate synthetic geoid elevation for the territory of Poland and to estimate influence of separate layers (topography, sediments, crust and mantle) on the gravity. The synthetic geoid undulations were compared to an existing gravimetric quasi-geoid solution. The modeling showed that after eliminating influence of topography, sediments and the crystalline rocks down to the Moho boundary we still observed the residual that could be explained by only by influence of density inhomogeneities in the upper mantle. The residual geoid data was inverted in order to evaluate density variations in the upper mantle down to a depth of 250 km. The resulting distribution of high and low densities in the mantle correlates well with surface heat flow data, suggesting that the density inhomogeneities are mainly due to variations in mantle temperature.