Project objectives

The project aim to recognize the structure of the Earth down to the 60 km depth in Poland and its surroundings. This structure is characterised by large variability in several parameters like density or composition. In shallow depths down to several kilometres we observe sedimentary layers, deeper we find crystalline rocks, and below 45 km we observe significant change of different parameters moving to the Earth's mantle. Estimation of those parameters is difficult, especially at large depths, but one of them the velocity of seismic waves can be recognized relatively easily. To do that we can generate small Earthquakes, using for example small, controlled chemical explosions, and observe propagation of seismic waves at different distances. Thanks to those observations we can estimate seismic waves velocities at different depths, and what is important to us in three dimensional space.

Planned studies

Active seismic studies to recognize the deep Earth are carried out with great successes for many years. They use some approximations, like simplified waves propagation (ray-theory), or two dimensional approximation of true geometry. In proposed project we would like to extend this research to full 3D geometry and use all available data that has never been used together. For interpretation we will use modern computational algorithms based on high performance computers. In data processing we will use well known methods of signal enhancement, that are widely used in oil and gas industry. We will adapt those methods, and apply them to regional data, giving us stronger useful observations.

Reasons for choosing the research topic

A precise knowledge about the Earth structure is important in several fields of geophysics. In pure science it is used to recognize a deep structures down to hundreds of kilometres with better precision. Good reference model is also useful in precise localisation of natural and induced earthquakes. It is important in seismic hazard studies, that assure seismic safety for people and critical objects like nuclear power plants. Because of that our reference model have to have a maximal possible precision, and be based on the newest interpretation techniques.