DESCRIPTION FOR THE GENERAL PUBLIC

The aim of the project is the determination of seismic anisotropy of the lithosphere (Earth's crust and part of the upper mantle) in the area of Lower Silesia based on broadband seismograms of local, regional and distant (teleseismic) earthquakes. The Lower Silesian region has a very interesting and complicated geological structure. We are dealing here with two major tectonic units: the Sudetic Block and the Fore-Sudetic Block. They were formed during long and complex tectonic evolution, started in the Upper Proterozoic and reactivated in Tertiary duerni the Alpine orogeny.

One of the main goals of the seismic research is to determine the distribution of the velocities of the seismic P- and S-waves, as they are important parameters not only characterizing elastic properties of rocks, but also providing indications about their chemical and mineral composition as well as their structure (microcracks, porosity etc.). Another geophysical property of rocks, important for studies of the lithospheric structure and evolution, is the anisotropy of the seismic wave velocity. The seismic anisotropy phenomenon is defined as a dependence of the velocity on the direction of their propagation. Most of the minerals constituting the Earth's crust and upper mantle manifest more or less distinct seismic anisotropy, due to anisotropy of the crystalline lattice (intrinsic anisotropy). If the rock consists of coherently aligned mineral crystals (CPO – crystal preferred orientation), it exhibits anisotropy measureable by seismic means. Another causes of seismic anisotropy of rock massifs involve the presence of coherently aligned cracks or thin layering of rocks, but for lower crustal and upper mantle rocks the mechanism of intrinsic anisotropy due to CPO dominates. Therefore, seismic observations documenting a directional dependence of the velocity of longitudinal waves (P) and shear waves (S) and the S-wave splitting phenomenon provide the information about the orientation of the crystallographic axis of minerals and about rocks composition. Variability of the parameters of seismic anisotropy can be due to differences in composition, to variation of the direction tectonic movements or of the stress field in the studied area. It allows for discrimination between lithospheric blocks with different petrological composition and different tectonic evolution based on *in situ* measurements of seismic anisotropy.

The determination of the seismic anisotropy of the crust and upper mantle requires a use of methodology based on seismological observations (recordings of the seismic waves produced by earthquakes) and numerical simulations of the seismic wave propagation in the Earth. In the first stage of the project, the main emphasis will be placed on collecting the observational data – the seismograms of the waves from local, regional and distant earthquakes and on computation of the parameters of seismic anisotropy , based on the analysis of the acquired data. In the second stage, the observations will be used to estimate the structure, seismic velocity and anisotropy distribution of the lithosphere beneath the seismic stations. The observations will consist of continuous recording of seismic waves by 23 modern, high-sensitivity and high-resolution broadband seismic stations during at least 1,5 year.

Interpretation of the model of the anisotropic crust and upper mantle of Lower Silesia will be carried out together with petrologists from the University of Wroclaw, whose one of the most important achievement is the recent discovery that xenoliths from the area of Lower Silesia show two lithologies of mantle lithosphere: lithology "A", associated with relict lithospheric mantle, and lithology "B", strongly metasomatically changed during the Alpine orogeny. If "A" and "B" peridotites present in the lithospheric mantle of the Lower Silesia form large, coherent masses, it would be possible to determine their spatial distribution based on *in situ* measurements of seismic anisotropy. This would be valuable for a better understanding of the regional tectonic evolution of the study area. Seismic results will be compared with petrological measurements of crystal preferred orientation (CPO) in xenoliths from Lower Silesia performed now by petrologists from the University of Wrocław.