The surface of the Earth is formed by external and internal processes (e.g. volcanism or earthquakes), which later can have a significant impact on human life. Internal processes can be studied only indirectly, and the knowledge about the structure of the Earth's interior is crucial to understand them. The better the structure of the Earth's interior is known, the better theoretical models/equations for describing and predicting the processes occurring at the Earth's surface can be created.

The aim of the project is to determine the seismic structure of the Earth's mantle from the analysis of surface waves generated by earthquakes and recorded by gravimeters used commonly to study the tides of the Earth. Surface waves penetrate the Earth's interior, more deeper than longer their periods are. Therefore, the speed of the wave propagating along the surface of the Earth depends on its period and the structure of the Earth's interior. The analysis of the signal recorded by instruments allows to determine the dispersion curves of surface waves, from which by inversion methods, the velocity distributions of seismic waves with depth can be estimated for better recognition of the structure of the Earth's interior.

Modern tidal gravimeters record relative global and local changes in gravity without distortions for frequencies lower than 1 mHz. Typical broadband seismometers record the velocities of displacement of the Earth's surface without distortions in the frequency range from 8.3 mHz to 50 Hz. Records of surface waves, with frequencies from 1 to 6 mHz penetrating the Earth's mantle up to a depth of 1000 km, are very distorted by seismometers and very little by gravimeters. In particular, the analysis of superconducting gravimeters, characterized by sensitivity in the frequency domain at the order of nGal (10^{-11} m/s^2), gives a unique opportunity to study long-period surface wave, what previously was unattainable in seismic surveys.

The concept of research proposed in the project is based on the application of the seismic method to the records of earthquakes obtained by tidal gravimeters and verification of results by comparing them with the results of analysis of the records of seismometers, located in the same places as gravimeters. During the project, the records of earthquake obtained by the gravimeter-seismometer pairs will be analyzed, both from a previously carried out pilot project, as well as measurements conducted during the project and recordings of superconducting gravimeters from the IGETS database (GFZ Potsdam) and seismometers from the ORFEUS (Europe) and the IRIS (USA) databases. Transfer functions and scale coefficients of tidal gravimeters in the range of seismic frequencies will also be determined.

The models of the Earth's mantle obtained as a result of the project will be unique because they will be developed on the basis of records from which the absolute values of the velocity of seismic waves in the Earth's mantle can be calculated. The models of the Earth's mantle obtained from the tomography of first onsets of body waves provide relative information about the velocity distributions. Thus the information about the percent deviations of the velocity values from the applied reference model can be obtained. The research methodology developed in the project could be applied to the surface wave records of any tidal gravimeter, providing that adequate sampling frequency of records (minimum 1 Hz) will be available. The obtained mantle models will allow verification of already existing models, obtained on the basis of other seismic data and methods.