Earth Orientation Parameters (EOP) describe the rotation of our Planet and are required for a number of applications, that include pointing of astronomic instruments, communication with deep space objects and precise positioning and navigation of the objects at the Earth's surface with the use of Global Navigation Satellite Systems (GNSS). Polar motion represents two out of five EOP that link the terrestrial reference frame with the corresponding celestial frame. The rotation of our Planet is not constant over the time and these variations are caused by gravitational impact of the Moon, the Sun and other planets together with disturbances in mass redistribution of atmosphere, oceans and land hydrosphere.

The changes in distribution of Earth's surficial fluids (such as atmosphere, ocean and land hydrosphere) that affect polar motion, can be determined from observations of disturbances of the Earth's gravity field. In the years 2002-2017, such unique data was provided by the satellite gravity mission GRACE (*Gravity Recovery and Climate Experiment*). The representation of changes in the gravity field of our Planet was obtained from the analysis of changes in the distance between two satellites placed in the same orbit. For example, when the satellites flew over Himalayas, these changes in distance were comparable to the thickness of a human hair. These observations have been and are still being made available to the scientific community, among others, in the form of spherical harmonic coefficients of the Earth's gravity potential. In May 2018, a new stage in the study of the Earth's gravity field began – the new GRACE Follow-On mission has been launched and is believed to provide data with even better accuracy.

The GRACE observations are used in many scientific tasks, such as interpretation of changes in polar motion, monitoring of sea-level changes, observing the ice mass loss in polar regions, detection of groundwater level changes and indication of floods and droughts. In the frame of this project we would like to focus on the use of gravimetric observations in the study and interpretation of the polar motion. The main subject of the research will be an in-depth analysis and comparison of solutions from the finished GRACE mission as well as new solutions from GRACE Follow-On observations in this aspect.

We will also examine the agreement between changes in polar motion obtained from the analysis of gravity field with hydrological signal in polar motion obtained from observations with geodetic techniques (with so-called geodetic residuals – GAO).

Another objective of the project is to develop a combined solution, based on available GRACE series, that will be distinguished by the best agreement with observed changes in polar motion excitation.

We will analyse changes in polar motion in various spectral bands: short-term, long-term, seasonal, interannual, decadal, trends.

Another objective of the project will be an attempt to answer the question, which of almost twenty series from the GRACE mission are the most suitable for the study of Earth's rotation in the mentioned frequency bands. Over the past 15 years, many leading research institutes undertake to process raw observations of changes in distance between GRACE satellites. However, although all data centres used the same observations and similar models, the discrepancies between particular solutions exist and these differences also concern the agreement with observed changes in polar motion. The results obtained in the project will help us indicate the main reason of these discrepancies.

The results obtained in the project would improve our knowledge on polar motion excitation, especially the role of land hydrosphere in this process.