Time variations of the gravity field derived from time series of geopotential model developed from GRACE data can be interpreted in terms of geoid heights, and mass time variations with unprecedented temporal resolution.

Following the results of authors previous research, the series of monthly solutions of geopotential models developed from GRACE data in JPL, filtered with the use of DKK1 filter, and GLDAS hydrological model were used in the analyses. Variations of hydrology as well as variations of geoid heights for the period August 2002 – June 2010 at the continental part of Europe and selected 14 subareas were estimated with spatial resolution of 0.5º×0.5º. Variations in mass distribution obtained from geopotential models were compared with the respective results obtained from hydrological data.

Over the period of the GRACE observation, annual periodicity of the hydrology and geoid heights is observed with minima in September and maxima in March. For the area of Europe also the linear trend is occurring. Contrary to the area of northern Europe where dominates secular trend, for the subareas of central Europe only the annual periodicity appears. Results obtained using GRACE data show high correlation with the results calculated using hydrological GLDAS models.

Models of geoid height changes (parameters of trend and seasonal variations) were determined for the area of Europe and for 14 subareas. To verify models of geoid height changes, over the period July 2010 – October 2010 values of geoid height changes calculated using GRACE data were compared with values based on the models developed.