Based on GOCE, GRACE, LAGEOS and Earth gravimetric data, a new model of the static and time-variable gravity field has been computed: EIGEN-6. This model includes 8.5 years of LAGEOS-1/2 and GRACE data, 8.5 months of GOCE, and the DTU10 surface gravity data. It is complete to degree and order 1440 and was jointly elaborated by GFZ Potsdam and CNES/GRGS Toulouse. High-resolution global gravity field models play a fundamental role in geodesy and Earth sciences, ranging from practical purposes, like precise orbit determination, to scientific applications, like investigations of the density structure of the Earth’s interior.

EIGEN-6 also contains a time-variable part, up to degree and order 50, in the form of "secular", annual and semi-annual coefficients (the term secular is between double quotes since it can only validly represent the linear trend during the GRACE period of observation). Time-varying gravity field is important from a geodetic and geophysics point of view since it is a signature of the re-arrangements of mass within the Earth system, mainly water transfers (in solid, liquid and vapour form), and Glacial Isostatic Adjustment (GIA). In this presentation, we focus on the time-variable coefficients and we compare them with different hydrological and GIA models. Although the spatial resolution of the geodetic mass re-distribution solutions is still rather coarse - 400 km -, the length of the data span - 8.5 years - allows now to compute them with little need for stabilization. It is then possible to compare quantitatively the geodetic solutions with the corresponding geophysical models with a reasonable accuracy.