



GOCE gravity field models following the time-wise approach

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Since the launch of the European Space Agency's (ESA) Gravity field and Ocean Circulation Explorer (GOCE) satellite in 2009 and its end in 2013, a sequence of official GOCE gravity field models was released. One of the series of models follows the so called time-wise approach (EGM_TIM). They are purely based on GOCE observations such that they are independent of any other gravity field information available and describe the Earth's gravity field as seen by GOCE. Recently, the fifth release, EGM_TIM_RL05, was computed and made available to users.

The models of the time-wise series were computed within the ESA funded High-level Processing Facility (HPF) and are part of the official ESA GOCE products. Calibrated gravity gradients in the gradiometer reference frame and the satellites position as derived by GPS measurements entered the solutions as observations. Together with the spherical harmonic coefficients, a realistic the full covariance matrix is provided reflecting the model quality. This contribution summarizes the gravity field models derived with the time-wise approach. The method is summarized and the progress along the five releases is highlighted. Special focus is put on the final release 5, the gravity field model which includes all data collected during the entire GOCE mission. This model, parametrized as 78,957 spherical harmonic coefficients (spatial resolution of 71 km), was determined from $4 \cdot 10^9$, 799,264 gravity gradient measurements and 108,754,709 three dimensional positions within a joint least squares adjustment procedure. As this gravity field models only depend on GOCE observations, the gain of GOCE compared to other missions and other gravity field products can be clearly demonstrated. With release 5 of the time-wise model, a pure GOCE based model with a mean global accuracy of 2.4 cm at a spatial resolution of 100 km for the geoid is available (0.7 mGal for gravity anomalies).