



Mass-related excitation of polar motion: An assessment of the new RL06 GRACE gravity field models

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GRACE time variable gravity field models can be used to determine effective angular momentum functions (so-called excitation functions) which describe mass-related excitation mechanisms of Earth rotation. Since 2018 the GRACE science teams at the Center for Space Research (CSR), Austin, the GeoForschungsZentrum (GFZ), Potsdam, and the Jet Propulsion Laboratory (JPL), Pasadena, provide the new Release-06 (RL06) monthly GRACE gravity field solutions. In addition the Institute of Theoretical Geodesy and Satellite Geodesy (ITSG) of the Graz University of Technology provides the new ITSG-Grace2018 monthly and daily gravity field models which also incorporate the new RL06 background gravity models. Most important are the variations of the degree-2 spherical harmonic potential coefficients C_{21} and S_{21} as these are directly related to polar motion excitations. These coefficients show significant modifications with respect to earlier releases since the mean pole model has been changed from cubic to linear.

In this study we show that due to the latest release update from RL05 to RL06 the signal-to-noise ratio and the consistency of the CSR, GFZ, JPL and ITSG GRACE solutions could be significantly improved as well as the accordance with external validation time series for the integral and oceanic mass effects. Beside GRACE data the integral mass effect can also be derived from precise Earth Orientation Parameter (EOP) time series reduced by the motion-related effects (atmospheric winds and oceanic currents) based on geophysical model data. The oceanic mass effect can be derived from ocean models such as ECCO (Estimating the Circulation and Climate of the Ocean) and MPIOM (Max-Planck-Institute Ocean Model).