

The use of sub-monthly GRACE/GRACE-FO solutions to determine gravimetric excitation of polar motion

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Abstract. The Earth's rotation varies in time and these changes can be described with Earth Orientation Parameters (EOP). EOPs represent the rotational part of the transformation between the current releases of the International Celestial Reference Frame (ICRF) and the International Terrestrial Reference Frame (ITRF).

Here, we focus on the changes in the orientation of the Earth's rotational axis in relation to the terrestrial reference frame known as the polar motion (PM). The main conductor of non-tidal changes in PM is temporal variability of mass distribution of atmosphere, oceans, hydrosphere, and cryosphere. With the launch of the Gravity Recovery and Climate Experiment (GRACE) and GRACE Follow-On (GRACE-FO) missions, a new era of using global gravity data to determine gravimetric excitation of PM has begun. This can be done with the use of equations that describe linear relationship between degree-2 order-1 coefficients of geopotential and equatorial components of PM excitation.

In this presentation, we use daily and 10-day GRACE/GRACE-FO gravity field solutions provided by the Institute of Geodesy at Graz University of Technology (ITSG) and Centre National d'Études Spatiales (CNES) to determine gravimetric excitation of PM. Specifically, we test the usefulness of those data to analyse PM excitation at sub-monthly time scales. This is the first study of this type, because so far only monthly solutions have been used for this purpose. We study several types of oscillations in PM excitation series and make a comparison between gravimetric excitation (computed from GRACE/GRACE-FO data) and geodetic excitation determined from observations of pole coordinates after removing atmospheric and oceanic signals. This analysis aims to check whether the daily and 10-day solutions carry any additional information about PM that is not provided by monthly data.