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Assessing the role of corrections included in the GRACE/GRACE-FO data in determination of hydrological and cryospheric signal in polar motion excitation

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Assessing the impact of continental hydrosphere and cryosphere on polar motion (PM) variations is one of the crucial tasks in contemporary geodesy. The pole coordinates, as one of the Earth Orientation Parameters, are needed to define the relationship between the celestial and terrestrial reference frames. Therefore, the variations in PM should be monitored and interpreted in order to assess the role of geophysical processes in this phenomenon.

The role of hydrological and cryospheric signals in PM is usually examined by computing hydrological excitation (hydrological angular momentum, HAM) and cryospheric excitation (cryospheric angular momentum, CAM) of PM, commonly treated together as HAM/CAM.

The Gravity Recovery and Climate Experiment (GRACE) and GRACE Follow-On (GRACE-FO) missions deliver temporal variations of the gravity field resulting from changes in global mass redistribution. The so-called GRACE/GRACE-FO Level-3 (L3) data delivers changes in terrestrial water storage (TWS) that can be used for computation of HAM/CAM.

For best possible representation of TWS, a number of corrections are introduced in the L3 data by computing centres. Such corrections are, among others, glacial isostatic adjustment (GIA) correction, geocenter correction and C_{20} coefficient correction.

The main goal of this study is to examine the impact of corrections included in GRACE/GRACE-FO data on HAM/CAM determined. More specifically, we test their influence on HAM/CAM trends, seasonal changes and non-seasonal variations. We also examine the change in compliance between HAM/CAM and hydrological plus cryospheric signal in geodetically observed excitation when the corrections are used. To achieve our goals, we use GRACE and GRACE-FO L3 datasets provided by Jet Propulsion Laboratory (JPL), Center for Space Research (CSR), and Goddard Space Flight Center (GSFC).