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Evaluation of Contemporary Geocenter Motion Solutions

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Geocenter motion, traditionally defined as the motion of the center of mass (CM) relative to the center of figure (CF) and is represented as the changes of degree one spherical harmonics, is widely concurred as resulting from mass redistribution within the Earth system. Accurate geocenter motion estimates are important for the improved realization of the International Terrestrial Reference Frame (ITRF), are critical components of Earth's surface mass load, and have been postulated to be important to quantify secularly or long period mass changes of the Earth for example, to correctly interpretation mass signals observed by GRACE. Previous studies have used different methods for estimating geocneter motion including the use of satellite laser ranging (SLR of Lageos-1/-2), ground-based GPS, GPS tracking onboard of LEOs (GRACE satellites), DORIS, and hydrologic and ocean circulation models (GLDAS and ECCO) and loading models in combination with GRACE data. It has been stated that it is possible to estimate geocenter motion with an accuracy of 2–3 mm in seasonal signal amplitude and 20 degrees in phase. In particular, the z-component of the geocenter is much less well determined with the exception of SLR. The estimated geocenter motion solutions concentrated on seasonal variations. In this contribution, we provide an evaluation of contemporary geocenter solutions using various methods including our solution obtained by combining GRACE and other measurements, and the impact of accuracy of C20 change on the geocenter motion solution.