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Reconciling Estimates of Annual Geocenter Motion from Space Geodesy

By construction, the origin of the reference frame is coincident with the mean Earth center of mass, averaged over the time span of the satellite laser ranging (SLR) observations used in the reference frame solution. At shorter time scales, tidal and non-tidal mass variations result in an offset between the origin and geocenter, called geocenter motion. Currently, there is no model for the annual variation. This annual motion reflects the largest-scale mass redistribution in the Earth system, so it is essential to understand it for a complete description of the total mass transport. Failing to model it can also cause false signals in geodetic products such as sea height observations from satellite altimeters. However, inconsistencies in the estimates of annual geocenter motion have prevented the adoption of a consensus model. In this paper, it is shown that the various estimates can be reconciled, and that models for the annual geocenter motion can be recommended, depending on the application.