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Oral
We assess to what degree models of continental water, atmosphere, and oceans are consistent with geodetic observations of Earth's mass center. We postulate that, in the seasons, solid Earth deforms solely in elastic response to fluctuations in the mass of atmosphere, oceans, and continental water, snow, and ice. If true, we can estimate the displacement of Earth’s figure center (eCF) or Earth’s mass center (eCM) using just 1 geodetic site. We find, for SLR data in ILRS2020, and for GPS data in the GPS/Low Earth Orbiter/SLR solution of Haines et al. 2024, that the peak to peak seasonal oscillation of eCM relative to CM, the reference frame in which the 2 solutions are described, is 1–2 mm/yr, showing that the models of continental water, atmosphere, and oceans are consistent with geodetic observations of Earth's mass center to that accuracy. GPS positioning strenghtened with observations to Low Earth Orbiters in the solution of Haines et al. 2014 provides accurate estimates of the displacement of Earth’s (CM) mass center.

2. Estimates of the seasonal oscillation of CM relative to CF from SLR have persistantly been discrepant with those assumed in GRACE. In ITRF2008 and ITRF2014 the peak to peak seasonal oscillation of CM relative to CF is, in Z, 11.5 mm with a maximum northern position in January In ITRF2020, the seasonal oscillation in Z is half that size. What is the cause of this big reduction? Substituting ILRS2020 for ILRS2014 produces half the reduction; technical advances in estimating range biases improve the solution. New means for estimating CF from the geodetic site network produce the 2nd half of the reduction; approximating CF with the center of network had caused the estimate to be to big because most SLR stations are in in Europe or North America.
Meeting homepage
GRACE-FO 2025 Science Team Meeting
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