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The GRACE Follow-On (GRACE-FO) satellite mission is equipped with a Laser Ranging Interferometer (LRI) which measures the inter-satellite distance more precisely than the baseline Ka-Band Ranging (KBR). The along-orbit analysis of inter-satellite ranging residuals in terms of Line-of-sight Gravity Difference (LGD) has revealed that LRI improves the accuracy of in situ (along-orbit) gravity measurements at frequencies above ~75 CPR by at least one order of magnitude relative to KBR. We previously showed that most of the geophysical signals in this frequency band observed by LRI are dominated by static gravity signals. Since the GRACE-C mission, planned for launch in 2029, will only make use of an LRI sensor, there is a need for computing standard monthly-mean Level-2 (L2) solutions from this sensor. Here we present the monthly-mean L2 solutions form LRI using the LGD approach generated at University of Colorado Boulder. LGD LRI observations are obtained from range-acceleration residuals through a frequency-domain transfer function. We form daily normal matrices from LGD LRI observations in terms of spherical harmonics to maximum degree 180. Monthly time-variable gravity fields are then estimated by stacking the daily normal matrices in a month. We Perform a comprehensive evaluation of our L2 LRI solutions. We start by comparing their accuracy and performance in the spatial and spectral domain against the standard L2 solutions from GRACE-FO KBR as well as existing L2 LRI solutions. We also explore the utility of various independent in situ and satellite datasets to validate the added value in our L2 LRI solutions (beyond what is already observed in L2 KBR fields). We end by discussing the future steps for improving the accuracy of L2 LRI solutions generated at the University of Colorado Boulder.
Meeting homepage
GRACE-FO 2025 Science Team Meeting