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GRACE-FO is equipped with two sensors to track the inter-satellite distance; a baseline K-band microwave ranging system (KBR) and an experimental Laser Ranging Interferometer (LRI). The LRI flown on GRACE-FO provides a 1-2 orders of magnitude improvement in accuracy of inter-satellite range compared to the KBR over a wider range of frequencies. The LRI measurements have the potential to probe higher spatial resolution gravity and mass changes. Previous results from LRI have shown that this new sensor improves the sensitivity to static gravity signals from 300 km to 100 km, when compared to KBR. In this analysis, we apply along-orbit analysis of the inter-satellite residuals from the LRI and KBR in terms of Line-of-sight Gravity Difference (LGD) to bypass the temporal aliasing error, which causes the KBR and LRI inverted field to be of similar quality. We compute the synthetic LGD from a high-resolution ICESat/-2 mass change data and compare it with LGD observations from KBR and LRI to investigate the improved sensitivity of LRI in detecting small-scale ice-sheet mass changes. Using the along-orbit LGD analysis over four quarterly periods in 2019, intercomparison with ICESat/-2 mass change products reveals that the LRI can detect mass change signals up to about 120 cycles per revolution (CPR) which is equivalent to spatial scales above 140 km. This is significantly beyond the spatial resolution of standard GRACE solutions and KBR-derived LGD. This preliminary analysis using LGD approach shows the potential for along-track analysis as a tool to detect mass changes undetectable to conventional satellite gravity measurements.
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