

EGU2020-10566

<https://doi.org/10.5194/egusphere-egu2020-10566>

EGU General Assembly 2020

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Laser Ranging Interferometer on GRACE Follow-On: Current Status

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The GRACE Follow-On satellites were launched on 22nd May 2018 to continue the measurement of Earth's gravity field from the GRACE satellites (2002-2017). A few weeks later, an inter-satellite laser link was established with the novel Laser Ranging Interferometer (LRI), which offers an additional measurement of the inter-satellite range next to the one provided by the conventional microwave ranging instrument. The LRI is the first optical interferometer in space between orbiters, which has demonstrated to measure distance variations with a noise below 1 nm/rtHz at Fourier frequencies around 1 Hz, well below the requirement of 80 nm/rtHz.

In this talk, we provide an overview on the LRI and present the current status and results regarding the characterization of the instrument. We will address the scale factor, which is needed to convert the phase measurements to a displacement, and the removal of phase jumps that are correlated to attitude thruster activations. Moreover, the results comprise the coupling of attitude variations into the measured range, which is determined by means of the center-of-mass calibration maneuvers. This coupling is expected to be one of the major error sources at low frequencies, however, it is not directly apparent due to the large gravity signal.

We conclude with some learned lessons and potential modifications of the interferometry for future geodetic missions.

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