

## Scale parameters of the Earth sensitive to the optical response of spherical SLR targets

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Recent technology upgrades in SLR technique, especially driven by kHz laser ranging systems, make it possible to measure the station-satellite distance at mm precision. The optical response of a sphere-shaped SLR target has been one of the major error factors in measuring the two-way distance, and, following the study on AJISAI, LAGEOS and ETALON (Otsubo and Appleby, JGR, 2003), we look into relatively smaller targets, STARLETTE and its twin STELLA. Based on the detailed optical response simulation adjusted by the actual kHz laser ranging data obtained at Herstmonceux and Potsdam, it is calculated that the standard centre-of-mass correction value for STARLETTE is too small by 3 mm. The impact can be up to 0.5 ppb for the terrestrial reference frame scale and up to 1.7 ppb for the gravity constant (GM) of the Earth.

Long-term worldwide technology upgrades can have a systematic impact on the long-term trend of such scale parameters. As the intensity of photons received at a given detector is reduced, the detection point (timing) goes rearwards and the center-of-mass correction gets smaller as listed in Appleby and Otsubo (LW18, 2013). This can map a non-negligible drift especially in the GM parameter.

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