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Optical responses and centre-of-mass corrections for the sub-cm laser ranging targets LARES and Starlette

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The target signature effects of small spherical satellites, LARES and Starlette are investigated. Otsubo and Appleby (2003, JGR) have already looked into the effects for larger satellites such as Ajisai and LAGEOS, where the system dependence of the centre-of-mass correction amounts to 5 cm and 1 cm, respectively. Recent enhancement in precision and repetition rate of the laser ranging technique makes it possible to study the effects for smaller target such as LARES and Starlette. Using the fullrate laser ranging data obtained at Herstmonceux, UK, this study reveals that the center-of-mass correction can vary within 128 to 135 mm for LARES, and 75 to 82 mm for Starlette. The result of Starlette indicates that the current standard value 75 mm is too small in general. This study has an impact on the scale of the terrestrial reference frame and the gravity constant (GM) of the Earth.

Keywords: space geodesy, satellite laser ranging