Contribution of LARES-2 to Space Geodesy

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LARES-2 is a new geodetic satellite with the primary objective of verifying the Lense-Thrring effect emerging from general relativity. However, LARES-2 also contributes substantially to deriving global geodetic parameters. We assess the impact of LARES-2 on the determination of geocenter coordinates, low-degree gravity field parameters, and Earth rotation parameters from the combined LAGEOS-1/2 and LARES-2 solutions and compare the results to LAGEOS-1/2 solutions.

We found that the number of empirical orbit parameters that have to be estimated to absorb non-gravitational orbit perturbations is smaller for LARES-2 than for LAGEOS-1/2 satellites. LARES-2 consists of a solid sphere as opposed to LAGEOS satellites that have an inner structure with cubic cores. Opposite to LAGEOS satellites, LARES-2 does not require estimation of any once-per-revolution orbit parameters in the along-track direction or corrections for the solar radiation pressure coefficient, which results in extremely stable estimates of the Z geocenter component and C30 gravity field parameter. The only empirical parameter which has to be estimated for LARES-2 is the constant along-track acceleration to compensate for the Yarkovsky-Schach effect. We found that LARES-2 provides C30 estimates unaffected by thermal orbit modeling issues, as well as improves the formal errors of the Z geocenter component by up to 59% and C20 by up to 40% compared to the combined LAGEOS-1/2 solutions. Therefore, the contribution of LARES-2 to the reference frame realizations and deriving global geodetic parameters is essential.