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SESSION Session 1: satellite tracking and scheduling

TYPE Presentation

TITLE SLR contributions to time-variable gravity field and thermospheric neutral density estimates

ABSTRACT

Besides the ability of SLR to determine the Earth's figure and orientation, it is also possible to accurately estimate the Earth's time-varying gravity field. Moreover, for low Earth orbiting satellites, the neutral thermospheric density plays a crucial role due to the large perturbing (drag) acceleration. If multiple satellites (inclinations) are combined, various parameters can be estimated simultaneously in one common adjustment. In this study, we present the results of an Earth's gravity field solution purely based on SLR data. Using 6 or more satellites (LAGEOS-1, 2, Ajisai, Starlette, Stella and LARES, ...), it is possible (and reasonable) to solve for selected Stokes coefficients up to degree 6. The obtained results are compared to other SLR and GRACE solutions. The observations reveal a long-term ice gain/loss in high latitude regions even before the launch of GRACE. It is pointed out that especially the low altitude satellites are important for gravitational research.

In a second part, the ability of SLR to determine the thermospheric neutral density is discussed. Here, multiple density models are calibrated with an SLR multi-satellite solution. The obtained scaling factors are discussed and put into context to recent thermospheric density studies. We found that SLR observations to very low orbiting satellites (less than 300km altitude) are most valuable for thermospheric research.