Current topic for a Master's Thesis

Simulating extended SLR space and ground segments for the refined determination of global geodetic parameters

Satellite Laser Ranging (SLR) is an important space-geodetic technique for the determination of geodetic parameters such as coordinates and velocities of globally distributed SLR stations, origin and scale of a Terrestrial Reference Frame (TRF), Earth rotation parameters, and low degree and order coefficients of the Earth's time-variable gravity field. Additionally, SLR observations to selected near-Earth satellites are used for the Precise Orbit Determination (POD) and the validation of satellite orbits derived using observations of other space-geodetic techniques and combinations of them.

Within the upcoming years, the challenge will be to meet the ambitious goals of 1 mm absolute stability and 0.1 mm/year temporal stability of the defining parameters of TRFs which requires stable and high-performance, globally well-distributed observation networks (e.g., cf. figure), on the one hand, and the exploitation of new satellite missions, on the other hand.

The potential of extended SLR space and ground segments shall be investigated based on a simulation approach. The focus of the investigation shall be on the impact of the extension of the commonly used space segment presently comprising the four geodetic satellites (LAGEOS-1/2 and Etalon-1/2) by additional SLR-tracked satellites at various altitudes and orbit inclinations (e.g., ESA's new satellite missions Genesis). Additionally, an impact of the improved SLR network shall be investigated.

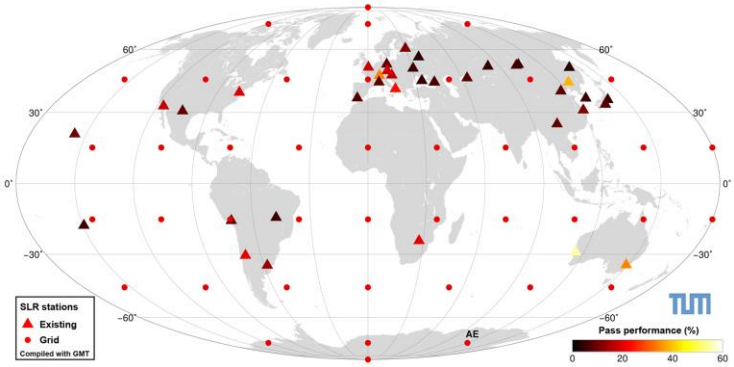

Figure: Global SLR station performance (cf. Kehm et al., 2019).

Main tasks:

- Analysis of the state-of-the-art performance and global coverage of the SLR station network and the observation distribution (in time and space) to SLR-tracked satellites.
- Simulation of SLR observations using the DGFI-TUM orbit computation software DOGS-OC for various scenarios (new stations, new satellites, etc.) based on realistic error assumptions.
- Assessment of the impact of an extended SLR space segment on the determination of global geodetic parameters.
- Investigation of the impact of an extended SLR network geometry (additional stations) or improved station performance on the determination of global geodetic parameters.

References:

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