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Adjustment of EOP and gravity field parameter from SLR observations

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Satellite Laser Ranging (SLR) plays a crucial role in observing and understanding global aspects of the system Earth. With its highly accurate laser ranging measurements SLR is the only geodetic observing technique which provides the origin (geocenter) and (in combination with VLBI) the scale for global terrestrial reference frames. Both entities are fundamental in monitoring global dynamic processes like mean sea level rise and Earth rotation and orientation.
The SLR observations to different satellites like e.g. Lageos 1 and 2, Stella, Starlette and Ajisai which are done by globally distributed network stations provide the potential for a combined estimation of station positions, Earth orientation parameters (EOP), spherical harmonics of low degree and order of the Earth gravity field together with orbit parameters of the satellites. However, the common adjustment of these parameters is a big effort, since there are correlations between orbit parameters like the Kepler elements or empirical accelerations and the first derivative of UT1. Also the spatial distribution of the SLR stations is a very important part in the parameter estimation.
On this poster we focus on multi-satellite combinations of at least Lageos 1 and 2. We discuss the solutions obtained from using observation data covering the time from 1994 until 2010. We focus on different orbit lengths in order to evaluate the stability of the consistent estimated TRF, EOP and gravity field parameters. Various solutions are compared with respect to its robustness and data quality. The accuracy of the estimated TRF is evaluated by comparing it with ITRF2008. The EOP are validated w.r.t. IERS 05 C04 and the spherical harmonics of degree two are compared with other solutions (e.g. SLR solutions and geophysical model results). For evaluating the satellite orbits we analyze the weekly/monthly RMS values of the orbit fit.