

LOD systematics from SLR observations. M. Bloßfeld¹, H. Müller², ³U. Hugentobler, ⁴D. Angermann, ⁵M. Gerstl, ¹Deutsches Geodätisches Forschungsinstitut (DGFI), Alfons-Goppel-Straße 11, 80539 Munich, Germany, blossfeld@dgfi.badw.de, ²DGFI, mueller@dgfi.badw.de, ³Technische Universität München (TUM), Arcisstraße 21, 80333 Munich, Germany, hugentobler@bv.tum.de, ⁴DGFI, angermann@dgfi.badw.de, ⁵DGFI, gerstl@dgfi.badw.de.

Introduction: Beside the estimation of station coordinates and coefficients of the Earth's gravitational field, laser ranging observations to near-Earth satellites can be used to determine the rotation of the Earth. One parameter of this rotation is ΔLOD (excess Length Of Day) which describes the excess revolution time of the Earth w.r.t. 86400 seconds. Due to correlations of the different parameter groups with the satellite orbit, it is difficult to obtain reliable estimates for all parameters in one common adjustment. In the official ΔLOD products of the International Earth Rotation and Reference Systems Service (IERS), the ΔLOD information determined from laser ranging observations is excluded from the processing.

In this paper, we study the existing correlations between ΔLOD , the orbital node Ω , the even zonal gravitational field coefficients, cross-track empirical accelerations and relativistic accelerations caused by the Lense-Thirring and deSitter effect in detail using first order Gaussian perturbation equations. We found discrepancies due to different a priori values by using different gravitational field models of up to 1.0 ms for polar orbits at an altitude of 500 km and up to 40.0 ms, if the gravitational field coefficients are estimated using only observations to LAGEOS 1 [1]. If observations to LAGEOS 2 are included, reliable ΔLOD estimates can be achieved. Nevertheless, an impact of the a priori gravitational field even on the multi-satellite ΔLOD estimates can be clearly identified.

Furthermore, we investigate the effect of empirical cross-track accelerations and the effect of relativistic accelerations of near-Earth satellites on ΔLOD . A total effect of 0.0088 ms is caused by not modeled Lense-Thirring and deSitter terms. The partial derivatives of these accelerations w.r.t. the position and velocity of the satellite cause very small variations (0.1 μs) on ΔLOD .

References:

[1] Bloßfeld M., Gerstl M., Hugentobler U., Angermann D., Müller H. (2014) *Systematic effects in LOD from SLR observations*, Adv Space Res 54, 1049-1063, DOI: 10.1016/j.asr.2014.06.009