

Mathis Bloßfeld

Contribution of consistent laser observations to Earth system sciences

As one of the key techniques of space geodesy, Satellite Laser Ranging (SLR) is the only technique capable to determine the origin and scale of the terrestrial reference frame (TRF) together with VLBI with very high accuracy. Moreover, SLR is a key technique for determining the long-wavelengths of the Earth's gravitational field. Using SLR observations, the TRF, the Earth orientation parameters and the Earth's gravitational field can be estimated in one common adjustment which allows scientists to study parameter correlations and interactions. Since retro-reflectors are totally passive and can be installed very easily on satellites, most of today's geodetic Earth orbiters are equipped with SLR tracking technology. Therefore, also for precise orbit determination (POD), SLR plays a crucial role. The presented paper gives an overview of present strategies to achieve the goals of the Global Geodetic Observing System (GGOS) and outlines the importance of SLR for the geodetic community. In particular, the current SLR-related space and ground segment are evaluated w.r.t. their potential for GGOS and the accuracy of selected geodetic products. As a case study, SLR observations to satellite constellations are used to realize a consistent estimation of the Earth's shape, rotation and gravitational field. Furthermore, selected geophysical applications are presented which emphasize the importance of consistent geodetic measurements for a reliable interpretation of global change phenomena. Finally, the strategy of the ILRS to meet these manifold and challenging goals is discussed.