



Combined SLR and GNSS solution using co-locations in space

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Different satellite geodetic techniques have specific strengths. The International Laser Ranging Service (ILRS) weekly standard solution based on LAGEOS and Etalon Satellite Laser Ranging (SLR) observations is well suited to determine the origin and the scale of a terrestrial reference frame. On the other hand the microwave-based, Global Navigation Satellite Systems (GNSS) solution from the International GNSS Service (IGS), has a strong contribution to the Earth Rotation Parameters (ERPs). To exploit the individual advantages of those techniques a rigorous combination also including the SLR measurements to the GNSS satellites is needed. A difficulty is that such a combined solution typically is dominated by the GNSS observations because they are supposed to be roughly 10 times more accurate than the SLR normal point data. Furthermore there is on average a factor of three thousand more microwave observations than SLR normal points.

In a simulation environment the true solution is known. We therefore used a newly established tool of the Bernese GNSS Software to simulate realistic SLR observations to determine a proper weighting of the SLR observations wrt. GNSS measurements in order to obtain a maximum benefit from both techniques in a rigorously combined solution. The goal is to impose the instantaneous center of mass of the Earth as determined by the spherical SLR satellites onto the GNSS satellites. At the same time the quality of the ERP series should not be degraded by the noisier SLR measurements.