The space-geodetic techniques GNSS and SLR are co-located on ground stations and at many satellites in space. Using satellite co-location implies that one common set of orbit parameters is estimated based on microwave and SLR observations together. We show the advantage of using the GPS and GLONASS satellites as co-location point. Due to uncertainties in the phase center modeling for the GNSS microwave antennas, GNSS alone cannot provide the absolute scale information. The estimation of a common set of orbit parameters, however, allows it to transfer the scale directly from SLR to GNSS. Therefore, a combined GNSS-SLR analysis using satellite co-locations at GNSS satellites allows it to estimate the satellite antenna offsets for the GNSS antenna without fixing the scale of the a priori reference frame.

For the SLR part, the offsets of the laser retro-reflector arrays (LRA) at the GNSS satellites have to be checked in the combined solution. One of the major difficulties of determining the SLR-related parameters from observations to GNSS satellites is the sparseness of SLR data. In order to further improve the stability of SLR-related parameters, we also include the SLR observations to the LAGEOS satellites. This allows it to estimate station coordinates more reliably and to separate the SLR range biases from the corrections to the LRA.

As a side effect of using LAGEOS data we will investigate whether the geocenter of the combined GNSS-SLR solution can benefit from such a procedure, and, as a consequence, whether the GNSS orbits can be improved.