

Simulation Study of SLR Data Compression Algorithms

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In 1984, a proposal was made for the methodology of SLR full-rate data screening and data compression to Normal Points (NPs). However, since the SLR ground stations usually generate their SLR NPs on site, using various computational methods for, e.g., detrending of full-rate residuals and screening approaches, the analysts are provided with an inhomogeneous set of NPs, which may lead to systematic errors and may have an impact on the estimation of the geodetic parameters.

The increasing availability of SLR full-rate data over the past few years enables a homogeneous formation of SLR NPs and a sophisticated analysis at observation level.

In a simulation study performed with a development version of the Bernese GNSS Software (BSW), the general loss of information due to SLR data compression to NPs is assessed by an orbit reconstruction. Furthermore, the stability of different screening techniques based on, e.g., RMS or leading edge, is analyzed. The simulated SLR data is based on modelled distributions of fit residuals, which included the variability of the optical behaviour of the satellites at different orientations.

Finally, real full-rate data from a reduced set of stations are homogeneously screened and compressed into NPs in the BSW. The quality of the newly generated NPs is evaluated by comparing the estimated geodetic parameters, e.g., Earth rotation parameters, geocenter and station coordinates, derived by weekly SLR combinations of LAGEOS-1/2 SLR NPs of the entire network.