Implementing consistent clipping in the reduction of SLR data from SGF, Herstmonceux

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Orbital analysis shows a correlation between SLR normal point (NP) residuals with RMS that is mainly present for stations operating at low energy levels of detection and made visible by averaging over sufficiently long periods. It was shown that for LAGEOS 1/2 a significant underlying cause is the orientation-dependent variability of the laser retro-reflector array. To address this correlation and for greater consistency between passes, the Space Geodesy Facility in Herstmonceux, UK is moving towards altering the way it forms normal points from SLR residuals.

Currently at the SGF, SLR observations, recorded at single-photon energy levels, are flattened by applying time and range bias corrections to a reference orbit. The residuals are then clipped at 3xRMS from the centre location of a Gaussian fit and used to form NPs. However, iterative NP processing algorithms such as this one, employed by most stations, show limited robustness to cope with the inherent data variability and this led us to explore more satisfactory data reduction strategies.

A new processing method fits a Gaussian profile to the front-only of the residual distribution and reliably locates the leading edge half-maximum. From this point, fixed, satellite dependent clipping is applied to capture the retro-reflector array. Beginning with the LAGEOS satellites and following the lead of the Graz SLR station, more consistent normal point observations are achieved with tight clipping to sample the very front of the satellite. The impact of adopting this new method on the Herstmonceux coordinate time-series is assessed.