Advancing Fully Automated SLR Data Reduction

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The computational methods employed at the SGF, Herstmonceux to develop an automated process for extracting SLR returns include real-time track detection, orbital correction, track identification from flattened range residuals and filtering for signal return rate. These were developed and tested over time using many observed SLR passes to the full ILRS target list.

Once a tracked satellite sets below the horizon the observation data file is closed and the SLR telescope can move to the next target. Ideally before long, another calibration measurement to a ground target is made and further meteorological readings are recorded. It is then ready to be reduced to extract the SLR return measurements from the surrounding noise points and generate normal points.

A continuously running, multi-process program organises the necessary calibration, track, prediction, status and meteorological files for each satellite pass. Data reduction must be able to account for the different distributions of data, including weaker return signals, intermittent data flows, greater background noise levels due to sky brightness and returns that were not detected in real-time. An autonomous process must also provide visual feedback of the final results for inspection.

A new method for clipping the data observed from flat tray retro-reflector arrays installed on GNSS satellites, which give elevation dependent signatures, is presented.

The corrected epochs and ranges recorded at Herstmonceux by two different event timers should closely agree. The normal points generated by this and the current manual reduction process are compared by orbital fit and are shown to agree at the millimetre level.