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NAME José Rodríguez
EMAIL josrod@nerc.ac.uk
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TITLE Variability of LAGEOS normal point sampling: causes and mitigation.

ABSTRACT

Residual analysis of LAGEOS normal point data shows, for a number of SLR stations, a strong correlation between residual values and normal point precision. Although the dispersion of the distributions of range observations collected by SLR stations to derive normal points should ideally be perfectly stable, several factors introduce variability in the data. We performed ray-tracing computations of laser pulses reflected off satellite LAGEOS at different incidence angles to simulate the returned signals for individual normal points. The results indicate that partial sampling of the retroreflector array is a significant, unavoidable source of variability. Excluding return rate fluctuations, this effect, plus purely random sampling and the presence of variable levels of background noise explain most of the observed dispersion in the normal point data, as well as the correlation with residual values in the orbital dynamics results. We discuss these sources of normal point variability and, using both simulated and empirical data, compare the performance of different screening methods in terms of their success to cope with it and ability to define a stable reference point.