

SYMPOSIUM ON SPACE DEBRIS (A6)
Orbit Determination and Propagation (9)

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thomas.schildknecht@aiub.unibe.chANALYSIS OF THE ORBIT DETERMINATION ACCURACY USING LASER RANGES AND
ANGULAR MEASUREMENTS**Abstract**

The increasing amount of space debris requires huge efforts for the tracking networks in order to maintain the orbits of all the objects. The precise knowledge of the positions of space debris objects is fundamental for collision avoidance maneuvers performed by satellite operators and for future active debris removal missions. It is very well known that the accuracy of an orbit determination process depends on the kind of observables used, their accuracy, the length of the observed arc, and the observer-target geometry of the observations. One possible solution to improve orbits and at the same time, reducing the amount of observation time, is the combination of different type of observables.

In this paper an in-depth study is carried out to investigate the benefit of adding laser range measurements to the classical optical astrometric observations in terms of improved accuracy of the determined orbit. In particular, after some validation tests to prove the effectiveness of the algorithm, it will be shown how different kinds of observables influence the accuracies of the estimated orbital parameters. Then, the influence of the observation geometry is analyzed and finally the improvements achieved on the orbit prediction, especially for high altitude objects, will be shown. All the mentioned tests are performed using real ranges from ILRS stations and real angular/laser measurements provided by sensors of the Swiss Optical Ground Station and Geodynamics Observatory Zimmerwald owned by the Astronomical Institute of the University of Bern (AIUB).