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INCREASING CAPABILITIES IN A GROWING RADAR NETWORK

Abstract

With the steady increase in the number of objects in Low Earth Orbit (LEO), there is a simultaneously growing need for reliable information on those objects' orbits. LeoLabs, Inc. is providing tracking data and collision avoidance services for satellite operators and state regulators to increase the safety of flight in LEO. Currently, the LeoLabs data is collected via 4 one-dimensional S-band radars at two locations in New Zealand and Costa Rica, and two UHF-radars in the United States of America, including the two-dimensional radar PFISR. To meet the growing demand and to provide tracking data for more objects and at a higher update frequency, LeoLabs is expanding their radar network over the next years by building additional S-band radar sites across the globe. Several more sites will become operational during the year 2022 and additional sites are in planning beyond that.

Several simulation tools were developed to support the planning of the new radar sites and to understand their impact on future data collection. Depending on the analysis, these simulations can calculate global revisit rates. They can also include additional constraints, such as object size.

The experiments focus on three main aspects: (1) The increase in global observations per day for objects in LEO which is mainly driven by the number of sites and the orientations of their field-of-views. This can be used to estimate the increased performance in specific orbits of interest. (2) The capability to detect new, formerly uncatalogued objects when such a new object passes through both field-of-views at the same site. This enables the generation of an initial orbit which is adequate to schedule subsequent measurements. (3) Launch and Early Operations (LEOP) support is used as an example of a special operations scenario happening regularly, which underlines an important aspect of the increased number of radars as a larger and more distributed network makes long black-out periods unlikely.

The results will demonstrate the future performance of the growing radar network and its impact on the safety of flight in LEO. These insights will also be used to strategically plan the additions of the next generation of radars and their locations.