

## Feasibility Study on Using SatNOGS to Improve Orbit Predictions for VLEO Satellites

The collaborative research center (CRC) "Advancing Technologies of Very Low Altitude Satellites (ATLAS)" at the University of Stuttgart, funded by the German Research Foundation (DFG), addresses the fundamental scientific and engineering challenges of rendering Very Low Earth Orbit (VLEO) accessible and extending satellite lifetime by an order of magnitude. As part of this research project, the fundamentals of VLEO satellite operations are being investigated by drawing on expertise gained from operating satellites at the University of Stuttgart.

The aim of this thesis is to investigate the feasibility of using the open-source SatNOGS network to improve orbit predictions for VLEO satellite operations. Compared to conventional LEO missions, satellites in VLEO face major challenges in Telemetry, Tracking, and Command (TT&C) due to higher orbital velocities and rapidly changing atmospheric conditions. Ground station tracking methods based on pre-calculated mean orbital predictions, such as Two-Line Elements (TLEs), often become unreliable because of rapid orbital decay. Alternative methods, such as utilizing Doppler measurements from the SatNOGS network, could be employed in addition to classical tracking approaches to improve tracking and ground station scheduling. This thesis focuses on assessing the technical feasibility of utilizing Doppler information from SatNOGS for orbit refinement and the integration in the IRS operations infrastructure.

### Your tasks

- Familiarization with VLEO satellite operations and the respective challenges
- Research on traditional orbit prediction methods (TLE-based and GPS-based tracking)
- Investigation of the SatNOGS network, API access, and available observational data
- Assessment of the feasibility of using Doppler information for orbit refinement
- Integration of a SatNOGS orbit improvement system into the IRS operations infrastructure
- Documentation

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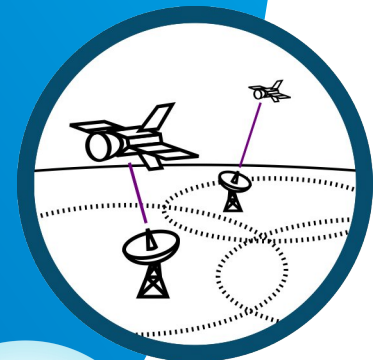
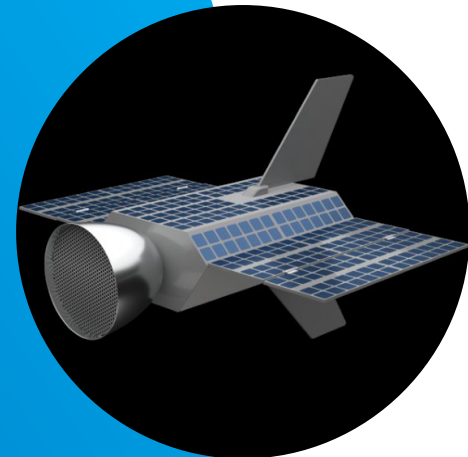
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