



Investigation of RGT orbit maintenance via aerodynamic forces

The Collaborative Research Centre 1667 “Advancing Technologies of Very Low-Altitude Satellites (ATLAS)”, funded by the German Research Foundation DFG, addresses the fundamental scientific and engineering challenges of rendering Very Low Earth Orbit (VLEO, about 200 km to 450 km altitude) accessible. These orbits are particularly beneficial for indispensable satellite services of our modern knowledge, information and communication society.

Repeating Ground Track (RGT) orbits enable satellites to revisit the same ground location periodically, but only certain orbital configurations meet the resonance between orbital motion and Earth’s rotation. As a result, some repeat patterns are not achievable at specific altitudes. Using aerodynamic orbit control offers a new way to influence mean orbital elements such as semi-major axis, inclination, and nodal drift. This could allow satellites in VLEO to maintain or even enable repeating ground tracks that are otherwise inaccessible. The task of this master’s thesis is to investigate this manoeuvring approach in detail.

Your tasks:

- Comprehensive literature research regarding VLEO, RGT orbits, and relevant perturbations;
- Implementation of the respective satellite and environment models in the optimization framework in MATLAB using GPOPS-II;
- Definition of suitable manoeuvre and system constraints;
- Analysis of RGT maintenance via aerodynamic orbit control;
- Investigation of possibility to enable deviating RGT patterns;
- Assessment of the results and documentation.

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Master Thesis Opportunity

