



Compensation of the effects of thermospheric wind on satellite orbits via aerodynamic lift

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.

Recent studies have indicated that atmospheric co-rotation with the Earth leads to a monotonic decay of orbital inclination. For missions that rely on maintaining a specific inclination, such as Sun-Synchronous Orbits (SSO), this phenomenon may have significant adverse implications. This master's thesis aims to investigate the feasibility of compensating for this effect without the use of propellant, by employing aerodynamic lift, thereby ensuring the fulfilment of mission objectives. To this end, a simulation framework that is being developed within ATLAS Project A06 will be utilized. The results serve to generate deeper insights in and expand the scope of application of aerodynamic orbit control.

Your tasks:

- Familiarization with VLEO, aerodynamic orbit control and the influence of thermospheric winds on the orbit;
- Analytical assessment of the practicality of the manoeuvre goal;
- Incorporation of the atmospheric co-rotation in the existing simulation infrastructure;
- Simulation of optimal SSO maintenance manoeuvres;
- Assessment of results and documentation.

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Master Thesis Opportunity

