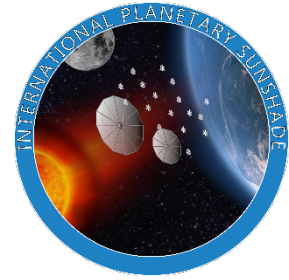


**Potential Topics for Bachelor's / Master's Thesis**  
**In the Framework of the System Analysis of the International Planetary Sunshade**  
**System to Mitigate Climate Warming**

Motivation:

Countering climate change is the most crucial challenge for humanity in the 21<sup>st</sup> century. One possibility to mitigate global warming without directly modifying the Earth's atmosphere is shading the Earth with one or several thin structures positioned at the Sun-Earth Lagrange Point L1 (SEL1). To achieve a sustainable concept, it is necessary to analyze the technological feasibility of producing these sunshades from space resources. Therefore, technologies for lunar in-situ resource utilization, manufacturing of sunshades in space, and ways to produce solar cells for powering production facilities and sunshades have to be examined. The trend of in-space manufacturing and international goals for lunar exploration can be utilized for accelerated sunshade development. Many technologies that are required to manufacture satellite structures in space or to operate sustainable lunar exploration are similar to those technologies required for producing sunshades in space. If pursued near-term, the timeframe for technology demonstration is feasible and the first sunshades of the IPSS system could be operated by 2060. In order to characterize the entire system concerning its technological as well as climatic potentials, an overall system modeling is targeted. For this purpose, the various system components must be analyzed, initial technological parameters must be derived to model the individual system components, and the deployment of a sunshade formation must be investigated to determine the potential shading impact. With such a model the impact of a sunshade mega-constellation in terms of controllability of global warming could be demonstrated and an alignment with other geoengineering measures could be enabled, to provide the crucial time buffer for struggling against climate change.



Potential topics for Bachelor's / Master's thesis are:

- Evaluation of Adaptive Sunshade Materials for Enhanced and Variable Climate Impact
- A Lunar In-situ Resource Utilization (ISRU) Infrastructure Concept for the IPSS System
- Evaluation of an AI-driven Control System for IPSS Sunshade Positioning
- Concept Development for a Quantum Communication Network for IPSS Control and Data Transfer
  
- Comparison of Space-based Solar Radiation Management Systems
- Evaluation of the Integration Potential of the IPSS with Earth-based Climate Mitigation Efforts
- Climate Modeling of Potential Sunshade Shading Patterns
  
- IPSS Impact on Global Water Cycle, Agriculture, and Biodiversity
- Legal and Ethical Framework for International Governance of IPSS Deployment
- Socio-economic Implications of IPSS on Developing Nations and Climate Vulnerability
- Public Perception and Acceptance of IPSS: A Global Survey and Analysis

...and many more! So, if you are interested in participating in a sustainable space-based geoengineering effort to mitigate global warming, send your CV and current grade transcript to [maheswarant@irs.uni-stuttgart.de](mailto:maheswarant@irs.uni-stuttgart.de). We can then arrange a personal meeting to discuss the specific topic.

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Start date: flexible

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