Paper ID: 77817
oral
student

IAF ASTRODYNAMICS SYMPOSIUM (C1)
Interactive Presentations - IAF ASTRODYNAMICS SYMPOSIUM (IPB)

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# NEW RESULTS ON THE MASS-OPTIMIZATION ANALYSIS OF A PLANETARY SUNSHADE SYSTEM

**Abstract**

The objective of this paper is to present a study on total mass-optimization of planetary sunshade systems, considering the launch, orbital transfer and final photogravitational Sun-Earth L1 halo orbit insertion and motion.

The Earth's climate changing is mostly due to the increasing concentration of greenhouse gas in the atmosphere which causes the general rise of the temperatures. To mitigate this, a space-based geoengineering infrastructure has been previously proposed to reduce the oncoming solar irradiance, by setting a 'solar light umbrella' between Sun and Earth.

In literature, the mass-optimization of a planetary sunshade system has been so far studied without including the orbital-transfer cost. Existing results show that, based on the dynamics system equilibrium of each satellite of the sunshade system, a relationship governs the minimum mass of the deployed sunshade system, photogravitational L1 position and desired mean solar irradiance reduction. Here, for the first time (to the best knowledge of the authors) the analysis of the mass-optimization of a planetary sunshade is extended to include the orbital transfer cost. The total minimum mass considering also the orbital transfer and orbital insertion cost, move the resulting equilibrium position.

The new results are compared with the existing ones. Furthermore, a preliminary evaluation of the numbers of launches from Earth, is presented. The basic assumptions made in this paper are: 1) all of the system is launched from the Earth's surface, 2) operational or planned heavy rocket-launchers are considered.