

Topics (T)

Space Technology for Climate Adaptation and Mitigation [2] (6B)

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SUNSHADES IN SPACE – AN OVERVIEW OF A POSSIBLE CLIMATE MITIGATION METHOD

Abstract

A possible way to mitigate the increase in global temperature due to greenhouse gas emissions is to place sunshades in space. By blocking about 1 % of the sunlight reaching Earth, the temperature will be decreased by 1-2 C. The best place for the sunshades would be close to the first Lagrange point in the Sun-Earth system, L1. This idea has been around in the literature for several decades but has until recently never been seen as a realistic alternative to geoengineering of the climate. However, due to rapid technological development, in particular regarding launchers, space-based sunshades are becoming a true possibility. How could we go about this great endeavor? We will discuss the challenges and possible options, such as launch, design and construction alternatives. Should sunshades be reflective or diffractive? What would be the optimal size of individual shades, which together need to cover an area in the order of millions of square kilometers? On-Earth or in-space manufacturing? How should they reach L1 – solar sailing, ion thrusters, or something else, and how do we control them once they reach L1? What is the best local orbit and formation? Can the shades be designed with additional utility, e.g. transforming the sunlight to power that can be beamed to Earth for use in the electrical grids? Finally, some estimates of the cost, timetable, side effects and ethical issues will be brought up.