

## **A Practical Crazy Plan——Umbrella**

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Just reflecting a small amount of sunlight back into the atmosphere can have direct and significant effect on the earth's cooling. This is what many people are trying on the ground. But why should we keep our eyes on the ground? It is our aim, but not our test site.

Can we keep the enemy far away? This is the Umbrella Project.

I imagine a flexible and lightweight film incorporating a mesh shaped from memory alloy, it can be fully folded. After transported by the spacecraft to the sun's synchronous orbit, it can be easily stretched out by inside memory alloy when in a weightless environment. Four micro motors are mounted on the edge of the umbrella, so it can be fully controlled. According to my preliminary calculation, take SpaceX's Falcon Heavy Rocket for example, the rocket can send at least 6km<sup>2</sup> of reflective surface to the intended orbit. According to the sunlight's power on the top of the atmosphere is 1.35KW/m<sup>2</sup>, one umbrella can reduce sunlight by 8.1\*10<sup>6</sup>KW for the planet. If we have enough umbrellas, the goal of cooling down the planet can be achieved very well. This is just rough estimation, if research more deeply, I think we will find surprise.

Cutting off the sunlight in space sounds like a fairy tale, but which is 100% feasible today. Falcon Heavy, for example, its current commercial offer is \$90 million, and as the rapid progress of space technology, especially recycling technology, the spacecraft costs will further reduce rapidly in the

fierce competition between the emerging and traditional space corporations. Combined with the cost of developing and producing umbrella, a fully deployed umbrella costs less than \$100 million, and large-scale implementation would undoubtedly further reduce the cost. With mere \$10 billion, more than 100 umbrellas can be deployed, reducing the sun's rays by 810 million KW. Now \$10 billion sounds likely to be a little large, but decades ago who would believe that there will be countless scholars ponder this question and countless funds are put into this? What's more, compared to some crazy plans with trillions' budget, the Umbrella can be cost-effective. Also, as mentioned above, with the progress of technology, after ten years, the cost of the project may have fallen by half, but the human's demand for solutions to cool down the planet is to grow almost absolutely, the necessity of such a plan is beyond doubt. Another importance is that Umbrella is different from the projects on ground, if administrated wisely, the service life of the reflective surface is almost infinite, once investment can be continuous use. In the future, we can even produce umbrellas directly in space. Because umbrellas are outside the atmosphere, we can even use it absorb, instead of reflecting, to generate electricity from the huge temperature difference. Achieving the maximization of utilization of resources, it also helps to cool down the planet.

Compared with the traditional scheme, the Umbrella is undoubtedly more forward-looking. And because the atmosphere can absorb a large amount of sunlight, Umbrella's unit area efficacy is much more efficient than those on the ground. Compared with the current radical plans, the absolute controllability of Umbrella is a huge advantage. For example, putting iron

into the ocean to promote plankton's growth and man-made volcanoes are too risky and they are impossible to be ended. Moreover, the umbrellas can be adjusted to defend only land, compared with many other schemes, which mainly act on the ocean that already have relatively high reflectance, Umbrella undoubtedly maximizes the utilization of resources. More importantly, it can be directly targeted at a certain area, such as the desert or other uninhabited areas, so that it does not affect normal agriculture etc. at all. Compared to the existing \$5 trillion budget space reflector plan of Roger Angel, from the university of Arizona, Umbrella has obvious and huge advantages in aspects of performance, cost, feasibility. What's more, his plan is composed of 16 trillion small objects, will no doubt worsen this situation of space junk.

To sum up, I believe that the umbrella plan is completely feasible and worth a try. According to today's trend, Umbrella is even one of the final ways to cool the earth.

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