

## Solar sails as space-based screens against Earth's climatic warming

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Solar Sailing in space: nowadays problems and tomorrow prospects of ecologically pure means of space travelling are discussed. Solar Sailing — unique form of spacecraft propulsion which uses the solar radiation pressure, permits to realize many space projects. Solar Sail — a large lightweight sheet of thin reflective synthetic film material reflecting the sunlight and drifting freely in space. It can be used against global warming of the Earth by changing artificially the solar radiation incident on the Earth  $1.390 \text{ kW/m}^2$  ('solar constant' at the Earth orbit distance). The radiation balance of the Earth is controlled by the Stefan–Boltzmann law and yields  $T = 288^\circ \text{ K}$  as the mean global temperature. To compensate the global climatic warming about  $2.5^\circ \text{ K}$  (global secular increase originating from the technogenetic greenhouse effect) we have to reduce the 'solar constant' by about 3.5%. How to do it?

The reduction 3.5% may be achieved with a minimum solar sail mirror area of  $4.5 \times 10^6 \text{ km}^2$  (tether of sail modulus) if a sail is positioned at  $L_1$  — collinear inner libration point — remaining on a straight line between the Sun and the Earth at all time. The libration point  $L_1$  position is determined by the photogravitational three-body problem solution for the system Sun – Earth – solar sail. Photogravitational  $L_1$ -point is located outward the Sun comparatively to the classic  $L_1$ -point, the delay being dependent on solar sail area-to-mass ratio.

### References

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