

# **NATURAL PERTURBATIONS AS ALLIES FOR SPACE DEBRIS MITIGATION AND LONG-TERM SUSTAINABILITY: THE CASE OF THE SOLAR RADIATION PRESSURE - OBLATENESS COUPLED EFFECT**

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It is widely recognized that the circumterrestrial environment is a resource that must be preserved. Among the various actions that are already part of the international guidelines or under discussion, end-of-life disposal solutions play a key role. For the sustainability of the space programs, advanced strategies should be conceived on the basis of novel technology and theoretical understanding. In this regards, the exploitation of natural perturbations to deorbiting is the cutting-edge of mitigation solutions.

In this talk, I will describe how the coupled effect of solar radiation pressure and Earth's oblateness can be used to re-enter into the atmosphere, following the so-called "de-orbiting corridors". These corridors correspond to resonant solutions associated with specific values of inclination and semi-major axis, and enable a natural growth of the orbital eccentricity. In the context of dynamical systems theory, the corridors are central and hyperbolic invariant manifolds stemming from the equilibrium points in the eccentricity-resonant angle phase space.

I will explain how to derive analytically the initial conditions associated with the corridors and the area-to-mass ratio required to exploit them. Finally, I will detail the numerical simulations that confirm the existence of the analytical deorbiting configurations and their effectiveness to control the growth of the space debris population.