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Title: *"Resonant signatures in the LEO region"*

Abstract. In the framework of the space debris problem, in order to mitigate the already critical situation in the Low Earth Orbit (LEO) region, and, more generally, to preserve the circumterrestrial environment, the scientific community is now aware of the need of designing feasible and effective solutions for the satellites' end-of-life. To this end, it is mandatory to obtain a deep understanding of the dynamics at stake. Within the H2020 ReDSHIFT project, we mapped the whole LEO region in terms of initial semi-major axis, eccentricity and inclination, for 16 combinations of longitude of ascending node and argument of pericenter, and 2 initial epochs. The dynamical model considered includes the geopotential of order and degree 5, lunisolar perturbations, solar radiation pressure (SRP) effects and atmospheric drag. The numerical simulations and specific analytical developments revealed the role of resonant inclinations associated with the just mentioned main perturbations. In particular, the resonances corresponding to the gravitational attraction of Moon and Sun and the SRP induce preferential paths which can be exploited to decrease the lifetime of the satellite, either in combination with the effect of the drag, or, if possible, using a SRP enhanced device. Besides the extension of the numerical results, the novelty of our findings consists in the theoretical understanding of the important role of lunisolar and SRP perturbations also in LEO. Concerning the SRP, resonances which were so far considered as secondary can play instead a fundamental role, and for values of area-to-mass ratio which can be achieved with the present technology.

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