Secular evolution of debris in highly eccentric and inclined orbits*

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Abstract. The motion of a test particle around an oblate Earth with external perturbations because of the Moon, Sun and other phenomena, is a very well studied subject. Nonetheless most of the existing studies approximate the system considering small eccentricities and inclinations, which is not always the case. Using the second order averaged Kaula expansion, for the Earth, and the Kaufman expansion, for the Moon and Sun, we extend the study of the secular evolution in the full domain of initial eccentricities and inclinations and we produce time efficient codes for the simulation of the secular dynamics. Atmospheric drag is another relevant effect for high eccentric orbits, which can be approached using the perturbed planetary equations.

Keywords: debris dynamics · secular evolution · high eccentric orbits.

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* Supported by the Stardust-R project.