

# 1 The Structure of Particles Rings Around the Earth

**Winter(1,2), O.C.,** Celestino(2), C.C. and Prado(2), A.F.B.A.

(1) Grupo de Dinâmica Orbital e Planetologia, UNESP – Guaratinguetá – Brazil

(2) Programa de Pós Graduação em Engenharia e Tecnologias Espaciais

INPE - São José dos Campos – Brazil

ocwinter@feg.unesp.br

A particle, that is subjected to the effects of the solar radiation and the oblateness of the Earth, shows a precession in its argument of the periapsis and a variation in its eccentricity. In the present case, a ring of particles is considered and this effect may cause different structures in its orbital evolution as a function of the orbital region and the size of the particles. In the simulations shown here, rings composed of several different sizes of particles were considered, initially in circular orbits around the Earth subject to the perturbations due to the solar radiation and the oblateness of the Earth for different orbital regions (LEO, MEO e GEO). The main goal is to explore the different structures on those rings. The numerical results show that the structures are in spiral form, considering the MEO region and particles of  $6 \mu\text{m}$ . Considering that the ring is formed by particles of  $100 \mu\text{m}$  in LEO, the structures are in spiral form during a time smaller than one year and, after that, the particles are scattered due to the precession of the argument of the periapsis, never returning to the spiral form again. Ring of particles in the GEO region do not present spirals for the sizes considered ( $6 \mu\text{m}$ ,  $10 \mu\text{m}$ ,  $20 \mu\text{m}$ ,  $50 \mu\text{m}$  e  $100 \mu\text{m}$ ). A study of the variation of the argument of the periapsis as a function of the size and the orbital region of the particle is performed, with the goal of explaining the different structures found in the orbital evolution of those rings.