DYNAMICS OF DUST PARTICLES FROM TWO GOSSAMER RINGS AND THE THEBE EXTENSION

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In this work, we investigate the dynamics of dust particles from two gossamer rings and the Thebe extension in the Jupiter system. The size range of dust particles (0.2-5 microns) are taken from Table 3 in [1]. A variety of important perturbation forces are considered in our analysis, including the Lorentz force, solar radiation pressure, Poynting-Robertson drag, the effect of the planetary shadow, solar gravity, the satellites' gravity, plasma drag, and the non-spherical effect of Jovian gravity. The spin model of Jupiter and states of the Sun and moons (four Galilean moons and four inner moons) are taken from high accuracy data of the NAIF SPICE toolkit. The initial jovicentric distances of particles are chosen to correspond to the peak densities of the two gossamer rings and the median of the extension's radial coverage, respectively. We simulated 1,800 dust particles started from the Jovian equatorial plane for each grain size over a maximum of 10,000 years until each grain hits a sink. It is found that a large amount of sub-micron particles are transported outwards to the region of the Galilean moons, and a few tens of percent of micron sized particles will finally impact the surfaces of Galilean moons. Our simulation results show that dust particles from the Thebe ring can be transported both inwards and outwards, and the reason for this is explained. The variation of the semi-major axis is analyzed, and several perturbation forces are found to be responsible for this variation. Finally, the relationship between the distributions of particles' orbital parameters (orbital elements and orbital distance) and resonance is presented.

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[1] H. Kruerger et al., Icarus **203**, 198 (2009).