ELECTROMAGNETIC EFFECTS ON THE ZODIACAL DUST CLOUD

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Electromagnetic effects on charged zodiacal dust particles were investigated. It can be shown that: 1) stochastic variations induced by electromagnetic forces are unimportant for the zodiacal dust cloud except for the lowest masses, 2) systematic variations in orbit inclinations are unimportant if orbital radii are larger than 10 A.U. This is due to the solar cycle variation in magnetic polarity which tends to cancel out systematic effects, 3) systematic variations in orbital parameters (inclination, longitude of ascending node, longitude of perihelion) induced by electromagnetic forces inside 1 A.U. tend to shift the plane of symmetry of the zodiacal dust cloud somewhat towards the solar magnetic equatorial plane, 4) inside 0.3 A.U. there is a possibility that dust particles may enter a region of "magnetically resonant" orbits for some time. Changes in orbit parameters are then correspondingly enhanced, 5) the observed similarity of the plane of symmetry of zodiacal light with the solar equatorial plane may be the effect of the interaction of charged interplanetary dust particles with the interplanetary magnetic field. Numerical orbit calculation of dust particles show that one of the results of this interaction is the rotation of the orbit plane about the solar rotational axis.

REFERENCE

Morfill G.E., and Grün, E., 1979, The Motion of Charged Dust Particles in Interplanetary Space. I. The Zodiacal Dust Cloud", Planet. Space Sci., to be published.

DISCUSSION

Lamy: How do you obtain $\langle \Delta i^2 \rangle$? Are you writing a full Fokker-Planck equation?
Grün: The method by which we obtained $\langle \Delta i^2 \rangle$ is fully described in the reference. In brief we calculated the diffusion in v_o (which corresponds to i) of dust particles along their zero-order trajectories which correspond to spiraling in toward the sun under Poynting-Robertson effect.

I. Halliday and B. A. McIntosh (eds.), Solid Particles in the Solar System, 311.