



Force Balance in Interplanetary Field Enhancements: Consistency with Small Dust Particle Pickup

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Interplanetary Field Enhancements appear as smoothly varying cusp-shaped enhancements in the interplanetary magnetic field that last minutes to many hours. These enhancements have been attributed to the pickup of charged dust by the solar wind, based on their associations with passage of asteroid, 2001 Oljato, near conjunction with the Pioneer Venus spacecraft during three successive apparitions and an association with comet De Vico. Since these disturbances travel at or near the solar wind speed, the physical dimensions of these disturbances are large. Therefore, the force exerted by the magnetic field increase on the plasma and the charged dust is very significant, enough to move a charged object of many kilograms mass outward through the gravitational potential. We have examined both the plasma pressure force and the magnetic force in a number of IFEs using the STEREO observations and find that the increase in magnetic pressure during an IFE is compensated by a decrease in plasma pressure, thus the apparent dilemma resulting from the strong forces is solved. The net force is small so the particle(s) must be small as well. Nevertheless we are left with the problem of how micron-sized dust particles can exert influence over perhaps 10^6 km and how the field and plasma pressure became anticorrelated. It is possible that these disturbances represent the pickup of charged dust clouds produced by collisions, but it is difficult to verify this through available observations.