

The Role of Lorentz Force in the Evolution of the Circum-Solar Dust Band

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Abstract

The charging processes of the dust particles in the near-solar regions, and the effects of the Lorentz force acting on such particles have been analyzed. It is found that the Lorentz force is capable of either forcing the micron-sized dust particles from the dust band at $4R_{\odot}$ (here R_{\odot} is the solar radius) to inner orbits, where they will suffer immediate vaporization, or removing these particles from $4R_{\odot}$ to outer regions, depending on the polarity of the solar magnetic field during solar maxima. These effects can possibly explain the lack of observations of the circum-solar dust band at $4R_{\odot}$ during solar eclipse occurring about the solar maximum. The magnitude of Lorentz force during average and minimum solar activity periods is very low. Therefore, this force will not be effective during these periods, and the dust grains will be able to spiral inward and form the dust band at about $4R_{\odot}$ again.