

Interplanetary Medium Dust - a dusty Plasma ?

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Measurements from spacecraft provide the only opportunity for in-situ studies of cosmic dusty plasmas and the most extended target for measurements is the interplanetary medium filled with cosmic dust and solar wind plasma. Though the interplanetary medium does not provide a dusty plasma according to its proper definition, dusty plasma conditions may locally apply. Moreover dust plasma interactions in the interplanetary medium were observed with different space experiments. Dust particles in the interplanetary medium reveal several processes of interaction with the solar wind. Due to solar radiation and solar wind the particles attain an electric surface charge and are deflected in the interplanetary field. Electromagnetic forces significantly influence the small dust particles, while gravitational forces dominate the dynamics of large particles. Dust destruction by sublimation and collision fragmentation feeds ions into the solar wind plasma and this is one of the mechanisms to generate solar wind pick-up ions. Passage of solar wind ions through dust particles generates neutral species with energies up to close to the solar wind energy. We compare dust and plasma parameters in the interplanetary medium and derive to what extent the dusty plasma conditions apply. We further review plasma wave measurements, in-situ measurements of pick-up ions and energetic neutral atoms as well as in-situ detection of the dust as tools to experimentally study the dusty-plasma and dust-plasma phenomena directly in a cosmic environment.