

Pickup Ion Observations at Solar System Bodies

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Ion pickup is one of the fundamental processes at work throughout the solar system. The ionisation of neutral gas provides fresh pickup ions which then interact with the plasma environment – e.g., the solar wind or a planetary magnetosphere. Initially the motion is acceleration along the electric field, but the presence of a magnetic field eventually causes a cycloid in real space and a ring in velocity space. Given enough time, scattering may occur in pitch angle and in energy. If there is a variation in the rate of pickup over the cycloid, non-gyrotropic ion distributions can be seen. Here we review the ion pickup process and the observations at comets (Giacobini-Zinner, Halley, Grigg-Skjellerup and Borrelly), and at Mercury, Venus, Mars and in the Saturn and Jupiter systems (particularly at Titan, Enceladus, in Saturn's inner magnetosphere and at Io) as well as in the solar wind itself. Data from several space missions are used (ICE, Giotto, DS1, Messenger, Venus Express, Mars Express, Cassini and Galileo). We compare the process and timescales in the various contexts, and look forward to future missions including Rosetta, BepiColombo and EJSM.

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