Titan's Interactions with Saturn's Magnetosphere

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Abstract

Titan's ionosphere interacts strongly with the magnetosphere of Saturn, shedding both neutral and ionized material into the magnetosphere and in turn collecting ionized particles and energy from it. Observations made with Voyager give ample evidence for strong plasma interactions that create a wake behind Titan in which material is stripped from the ionosphere and eventually redistributed throughout the magnetosphere. In addition it is known that energetic plasma from the magnetosphere supplies a significant part of the ionization and energy that goes into sustaining Titan's ionosphere. The physical processes behind the Voyager observations are, however, as yet poorly understood. In this paper we present results of initial studies made in preparation for the investigation of Titan's ionosphere and plasma environment by the Cassini Plasma Spectrometer (CAPS). The instrument consists of three separate spectrometers, two capable of measuring ion mass and velocity spectra from 1 eV to 50,000 eV, and a third capable of measuring electron velocity distributions from 1 eV to 30,000 eV. We thus anticipate making comprehensive measurements not only of Titan's ionosphere but also of its coupling to the sources and sinks of mass, momentum and energy in Saturn's magnetosphere.