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Magnetospheric Storms at Saturn and Earth

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Terrestrial magnetospheric storms are a well-known phenomenon in which plasma from the solar wind and the ionosphere is convected into the inner magnetosphere ("ring current") and energized by betatron acceleration and rapid changes in the magnetic field (substorms). Here we compare terrestrial storm characteristics with similar, newly found characteristics of Saturn's magnetosphere. We characterize Saturn's magnetospheric response to solar wind variability by using remote energetic neutral atom (ENA) measurements with simultaneous in-situ solar wind measurements when Cassini was outside the Saturnian magnetosphere.

The Ion and Neutral Camera on board the Cassini spacecraft have obtained global energetic neutral atom (ENA) images of the hot plasma of Saturn's magnetosphere since July 2004. INCA obtains ENA images in the $\sim$3-200 keV/nuc of protons and O^+. The typical observations show hot plasma distributed roughly between 6 to 30 R_S orbiting the planet at a period around the 10h45min rotation period depending on energy and species. However, some observations show how ENA intensity builds up on the nightside during intervals longer than the rotation period which indicates a gradual source of plasma. The intervals are often ended by a dramatic ENA intensification followed by a rotation of the newly injected plasma around the planet. We have selected a few of such intervals when Cassini was in the solar wind and could obtain solar wind parameters and simulataneous ENA image sequences. We use the Magnetic Field Experiment (MFE), the Cassini Charge Energy Mass Spectrometer (CHEMS), and the Cassini Plasma Spectrometer Subsystem (CAPS) to study the IMF, solar wind speed and density during these events and find that Saturn's magnetospheric activity most likely depends more on solar wind pressure than magnetic field orientation.