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Space Weather Monitoring for ISS Geomagnetic Storm Studies

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The International Space Station (ISS) space environments community utilizes near real time space weather data to support a variety of ISS engineering and science activities. The team has operated the Floating Potential Measurement Unit (FPMU) suite of plasma instruments (two Langmuir probes, a floating potential probe, and a plasma impedance probe) on ISS since 2006 to obtain in-situ measurements of plasma density and temperature along the ISS orbit and variations in ISS frame potential due to electrostatic current collection from the plasma environment (spacecraft charging) and inductive (vxB) effects from the vehicle motion across the Earth's magnetic field. An ongoing effort is to use FPMU for measuring the ionospheric response to geomagnetic storms at ISS altitudes and investigate auroral charging of the vehicle as it passes through regions of precipitating auroral electrons. This work is challenged by restrictions on FPMU operations that limit observation time to less than about a third of a year. As a result, FPMU campaigns ranging in length from a few days to a few weeks are typically scheduled weeks in advance for ISS engineering and payload science activities. In order to capture geomagnetic storm data under these terms, we monitor near real time space weather data from NASA, NOAA, and ESA sources to determine solar wind disturbance arrival times at Earth likely to be geoeffective (including coronal mass ejections and high speed streams associated with coronal holes) and activate the FPMU ahead of the storm onset. Using this technique we have successfully captured FPMU data during a number of geomagnetic storm periods including periods with ISS auroral charging. This presentation will describe the strategies and challenges in capturing FPMU data during geomagnetic storms, the near real time space weather resources utilized for monitoring the space weather environment, and provide examples of auroral charging data obtained during storm operations.