The International Space Station (ISS) program utilizes a plasma environment forecast for estimating electrical charging hazards for crews during extravehicular activity (EVA) [Koontz et al., 2012]. The forecast is derived from a series of ionospheric parameters obtained from radio occultation measurements and electron density profiles extracted from satellites. Ionosonde observations from the global network of ionosonde stations are distributed by NOAA's Space Weather Prediction Center. Financial support for MSFC personnel is provided by the ISS Program through ITA MSE and Technology Development Report, Johnson Space Center [Koontz et al., 2012].

A modified version of the hazard control process is now used by the ISS program that allows more than two arrays to be used following a PCU failure when conditions in the ionosphere are such that reduced charging is expected from solar interaction with the ambient plasma. This operational change due to these recent processes is an example of catastrophic hazards mitigation during EVA periods when FPMU data is not available.

Between 500 and 1000 GPS radio occultation measurements are collected hourly from the COSMIC/FORMOSAT-3 constellation over the Neutral Density at Northern Hemisphere high latitudes (see figure 2). For each occultation, the electron density is fitted to the model profiles and used to generate an electron density “surface” from which the electron density along the ISS orbit Ne(s) is extracted. This approach has been developed by the COSMIC/FORMOSAT-3 team and is described in detail in [Smith et al., 2010].

The COSMIC/FORMOSAT-3 constellation observes the Earth's ionosphere from low Earth orbit and measures electron density profiles with unprecedented spatial and temporal resolution. The electron density profiles are used to provide real-time estimates of the neutral density and ionospheric parameters, which are used to assess the risk of electrical charging hazards for astronauts during extravehicular activity.

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