Observations of deep ionospheric F-region density depletions with FPMU instrumentation and their relationship with the global dynamics of the June 22-23, 2015 geomagnetic storm

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The magnetic storm that commenced on June 22, 2015 was one of the largest storms in the current solar cycle. During this event, ionospheric F-region density measurements from the Floating Potential Measurement Unit (FPMU) on board the International Space Station (ISS) show dramatic depletions in the post-sunset (nighttime) local time sector at equatorial latitudes starting in the main phase of the storm and persisting on several subsequent orbits into the next day. Putting these low-latitude measurements in context with the global dynamics of the storm, we will present results from simulations and observations in our efforts to better understand the effects of this storm on the different regions of the coupled ionosphere-magnetosphere. The consequences of the magnetospheric penetration electric field and their role in the occurrence of these equatorial spread F observations will be investigated through the results of the SAMI3-RCM numerical model, a coupled ionosphere-magnetosphere model with self-consistent large-scale electrodynamics. Specifically, we will investigate the transient signatures of the interplanetary magnetic field component, Bz, and its role in driving the global convection electric field and ionospheric density redistribution. Lastly, measurements from the AMPERE Birkeland currents, DMSP drift velocities and the particle flux dropouts observed from the Magnetospheric Multiscale Mission (MMS) will be correlated with the FPMU density depletions and each other. Together these observations and simulation results will be assembled to provide each region's context to the global dynamics and time evolution of the storm.