

Measurement and Modeling of the Plasmasphere during the St. Patrick's Day 2013 and 2015 Geomagnetic Storms

Yuki Obana[1]; Naomi Maruyama[2]

[1] Engineering Science, Osaka Electro-Communication Univ.; [2] CU/CIRES, NOAA/SWPC

The plasmasphere is a region of cold plasma trapped in the inner magnetosphere by closed geomagnetic field lines. The comprising electrons and ions diffusively come from the underlying ionosphere. Thus, the properties of the plasmasphere are controlled by the dynamics of the magnetosphere, ionosphere, and thermosphere. The plasmasphere is typically eroded during a storm, with a time scale of hours, and refills during quiet times with a time scale of days.

Using cross-phase analysis of geomagnetic data from the CRUX magnetometer array in New Zealand, we determined the equatorial plasma mass density during the two St. Patrick's Day geomagnetic storms: March 2013 and 2015. Its trends during the 2013 storm present typical erosion and subsequent refilling features. On the other hand, during the 2015 storm, Plasma mass density values kept pre storm level throughout the storm time. Apparently, no erosion has happened.

Comparing these experimental results to model results from the Global three-dimensional ionosphere-plasmasphere-electrodynamics (IPE) model, we will discuss the plasmasphere dynamics and its coupling to the ionosphere-thermosphere system.