

SPACE WEATHER MAPS OF THE IONOSPHERIC ELECTRON DENSITY DURING THE 2003 HALLOWEEN STORM

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The geomagnetic storm that began on October 29 and continued through November 1, 2003 has been called the Halloween storm. It was one of the largest geomagnetic storms yet recorded. The NOAA Space Environment Center rated the storm as severe ( $Kp \geq 8$ ) or extreme ( $Kp = 9$ ) for 18 of the 72 hours of this storm. As with any storm of this magnitude, dramatic changes took place in the ionosphere. To understand these changes, ionospheric observations are processed with the Ionospheric Data Assimilation Three Dimensional (IDA3D) algorithm. IDA3D creates three dimensional space weather maps of the ionospheric electron density. These space weather maps show synoptic and global scale changes in the ionosphere. IDA3D is a 3DVAR objective analysis algorithm. It uses available electron density and electron content measurements and a statistical ionospheric model to make the best estimate of the true ionosphere. IDA3D is a flexible algorithm with several inputs including the model grid and the background climate model. For this study, the maps have been limited to  $\pm \sim 60^\circ$  (the maximum latitude of the GPS satellites) in order to concentrate on the behavior of the equatorial ionosphere. In addition, the Riley-ICED-Bent-Gallagher (RIBG) empirical model is used because it models both the ionosphere and the plasmasphere. During the Halloween storm, numerous observations of the ionosphere were made including electron content measurements from GPS receivers, both on the ground and on low altitude spacecraft, and tomography beacon receivers, and electron density measurements from ionosondes and satellite instruments. IDA3D weather maps show the variability of the equatorial anomaly peaks and a significant reduction of the plasmasphere.

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