Geophysical Research Abstracts
Vol. 20, EGU2018-11131-1, 2018
EGU General Assembly 2018

Investigating the geospace system response to the solar wind dynamic pressure enhancement on March 17, 2015 through global numerical simulations

Dogacan Ozturk, Shasha Zou, Aaron Ridley, and James Slavin
Climate and Space Sciences and Engineering, University of Michigan, Ann Arbor, USA (dcsoztrk@umich.edu)

When the solar wind dynamic pressure is enhanced, it compresses the Earth's magnetosphere causing large-scale perturbations in the intrinsically coupled magnetosphere-ionosphere-thermosphere (M-I-T) system. To understand how this global system responds to compression, the 17 March 2015 sudden commencement was studied using global numerical models. The Wind spacecraft recorded a 10 nPa increment in the solar wind dynamic pressure, while the IMF Bz became further northward. The Block Adaptive Tree Solarwind Roe Upwind Scheme (BATS-R-US), global MHD code was utilized to study the generation and propagation of perturbations associated with the compression of the magnetosphere system. In addition, the high-resolution electric field potential and auroral power output from the MHD model was used to drive the Global Ionosphere Thermosphere Model to investigate the I-T response to pressure enhancement. The electric field potentials and convection patterns in the polar ionosphere were significantly altered when the perturbation FACs moved from dayside to nightside. As a result of enhanced frictional heating, plasma and neutral temperatures increased at the locations where the flow speeds were enhanced, whereas the electron density dropped at these locations. The region between the perturbation FAC pairs experienced the most significant heating with 1000 K ion temperature increase and 20 K neutral temperature increase. The results of the simulation were compared with the Poker Flat Incoherent Scatter Radar observations and showed reasonable agreements.