MAS21-2021-000094

Abstract for an Invited Paper
for the MAS21 Meeting of
the American Physical Society

Interhemispheric Asymmetries in High-Latitude Magnetosphere-Ionosphere Coupling Processes[1]

HYOMIN KIM, New Jersey Institute of Technology

Given that the polar regions are critical for geospace research, the interhemispheric conjugacy and asymmetries in the polar regions remain an area fraught with unknowns and open questions, representing a barrier to understanding the coupled Magnetosphere-Ionosphere-Thermosphere (MIT) system. These interhemispheric features may manifest in a number of ways, including auroral patterns, induced electrical currents, geomagnetic field geometry, ionospheric electrodynamics, ion-neutral coupling, temperature and winds in the neutral atmosphere, and more. The interhemispheric differences can be attributed to a number of natural circumstances and various external drivers that interfere with complex coupling processes of the MIT system and complicate their signatures significantly. The MIT coupling processes associated with the energy input from the heliospheric system and the resulting feedback from the geospace can be misestimated due to the asymmetry, which has been overlooked. The assumption that the north and south are mirrored does not address the discrepancy found in observations and modeling work. We report on interhemispheric observations of geomagnetic pulsations and ionospheric convection in association with solar wind transient phenomena. The interaction between the solar wind and the magnetosphere induces a variety of geospace responses including electric currents and geomagnetic pulsations. Single-hemispheric observations, however, do not provide sufficient information on solar wind-magnetosphere-ionosphere coupling processes and energy transport to the geospace system. To address this issue, the present study focuses primarily on interhemispherically asymmetric features in the coupling processes associated with foreshock transient events by utilizing a ground instrument network at magnetically conjugate locations in both hemispheres. We investigate possible external drivers that affect asymmetries (e.g., IMF orientation, solar irradiance, geomagnetic activity, ionospheric conductivity, etc.). The spatiotemporal and spectral differences between the Interhemispheric responses are also reported.

[1]This work was supported by the NASA Living With a Star program under grant 80NSSC21K0132.