Topic: Storm effects on the global electrodynamics and the middle and low latitude ionosphere

Project Title:
Storm-Time Ionospheric Electric Fields

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Project Information:
We propose to use a very extensive database of plasma drift observations made on-board the Republic of China satellite (ROCSAT-1), Dynamics Explorer (DE-2), and Atmosphere Explorers E and C (AE-E and AE-C) satellites, as well as detailed ground-based magnetic field observations to study the storm-time, latitude-, and longitude-dependent response of mid- and low-latitude ionospheric electric fields to solar wind and magnetospheric disturbances. We plan to complement our experimental studies with numerical simulations using recent and future upgraded versions of the Rice Convection Model (RCM). The first basic objective of this proposal is to use this extensive combined satellite database of perturbation electric fields (obtained by removing quiet-time values along satellite orbits) to develop a detailed understanding of the local and storm-time, season, solar cycle dependent response of prompt penetration electric fields (mostly at low latitudes) to various solar wind-magnetosphere-ionosphere driving processes for different storm and solar cycle phases and seasons. These driving processes include the interplanetary electric field, IMF clock angle, and solar wind dynamic pressure. The second objective is the study of the longitudinal and latitudinal variations of the prompt penetration and disturbance dynamo electric fields under different geophysical storm conditions. This includes the study of the longitude-dependent relationship of low-latitude prompt penetration electric fields and subauroral polarization streams (SAPS). The third objective is the use of our experimental results for detailed testing of longitude-dependent predictions from global convection models, particularly during large magnetic storms. These studies should significantly improve the understanding of global characteristics of storm-time ionospheric electric fields and made a major contribution to future NASA missions, particularly to multi-spacecraft ionospheric missions.

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