Project Details

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Project Title:
Storm-time and solar cycle effects in the high-latitude magnetosphere-ionosphere coupling

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Summary:
Solar activity determines a global impact on a multi-scale, coupled system of geospace environment through the interaction of the solar wind (SW) plasma flow and interplanetary magnetic field (IMF) with the Earth .s magnetosphere. Existing abundance of various satellite observations obtained over last two decades motivates us to investigate if there are any significant effects in the solar wind-magnetosphere-ionosphere coupling regime with a course of the solar activity cycles. We will focus on the dynamics of the "quiet" and "storm-time" auroral oval and the corresponding changes in the global ionospheric plasma convection and field-aligned current distributions. In this way, we will be able to investigate how the "quiet" and "storm-time" magnetosphere-ionosphere coupling system evolves with the solar cycle. Thus, our overarching goal is to improve our knowledge of the role of solar influences in affecting the near-Earth space environment conditions. We propose to produce statistical patterns of the global high-latitude ionospheric convection, using ion drifts data from a series of DMSP satellites (1987-2001, 22-23 solar activity cycles), and the field-aligned currents distributions inferred from geomagnetic field measurements onboard the Magsat (1979-1980), rsted (1999-2001), and a series of DMSP satellites (1987-2001). We will undertake this statistical study separately for the quasi-steady, average IMF/SW conditions, for the extremely quiet times, and for the magnetic storms. The obtained results will be compared with the auroral emissions from UVI images taken onboard of the NASA .s POLAR spacecraft during 1996-2001 (solar cycle 23). Combining our studies of the statistical patterns and "case-by-case" events (specifically, magnetic storms and extremely quiet times), we will be able to separate effects of the "directly-driven" and "loading-unloading" processes (mainly responsible for the polar cap nd auroral zone disturbances, respectively) on the entire magnetosphere-ionosphere coupling system over the solar activity cycles. The resulting quantitative estimates can be utilized in various geospace circulation modeling efforts, including the global MHD models. The tools, resulting datasets, statistical models, and case studies will be made available for the scientific community via the SPRL World Wide Web site http://www.sprl.umich.edu/mist/.

Publication References:

no references