Geophysical Research Abstracts, Vol. 7, 03805, 2005
SRef-ID: 1607-7962/gra/EGU05-A-03805

Modeling the effects of geomagnetic storms in the ionosphere

M. V. Codrescu and T. J. Fuller-Rowell

CIRES, University of Colorado and NOAA, Space Environment Center, Boulder, Colorado, (Email Mihail.Codrescu@noaa.gov)

Modern technological systems including GPS and Galileo, HF communications, and radar ranging are affected by geomagnetic storms and sometimes become unreliable during large events. Geomagnetic storms arise from a large increase, often associated with changes in the spatial distribution, of the high-latitude energy deposition from the magnetosphere. The changes in energy input have global consequences. Wave surges, driven by impulsive energy inputs, propagate and interact globally, and are dependent on Universal Time (UT) and the time history of the source. There is a strong preference for wind surges to maximize on the nightside and in the longitude sector adjacent to the magnetic pole. Equatorward wind surges drive F-region plasma upwards and can initiate a positive ionospheric change. Expansion of high-latitude electrodynamic features into the mid-latitudes can also drive an initial positive response. The divergent nature of the wind field causes upwelling and changes to the neutral composition, that can be transported by the storm and background wind fields. Negative ionospheric phases result from increased molecular species. At low latitudes electrodynamic changes are initiated by penetration of magnetospheric fields followed by neutral wind dynamo effects. The electrodynamics proceeds through a sequence of reactions lasting more than a day. In this paper we review the state of modeling the ionosphere during geomagnetic storms, including the latest developments in data assimilation schemes, and illustrate the relationship between F-region and total electron content changes.