Geophysical Research Abstracts, Vol. 9, 07495, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-07495

Response of the Global Ionosphere to CME Events: Observations and Modelling

N. Balan(1), **H. Alleyne**(1), A. D. Aylward(2), I. McCrea(3), M. Andre(4), J. Jensen(5), B. G. Fejer(5) and G. J. Bailey(6)

(1)Control and Systems Engineering, University of Sheffield, Sheffield S13JD, UK. (2)Applied Physics Laboratory, UCL, London, UK. (3)Rutherford Appleton Laboratory, London, UK. (4)Swedish Institute of Space Physics,S-75121, Uppsala, Sweden. (5)Utah State University, USA. (6)Applied Mathematics, University of Sheffield, UK.

Using observations and modelling, the paper presents the relative importance of the main drivers of positive and negative ionospheric storms. In response to two long-lasting CME clouds that flowed pass the Earth during 07-12 November 2004, a rare super double geomagnetic storm with three positive initial phases occurred, and the ionosphere (Nmax and TEC) showed a strong positive ionospheric storm at low and mid latitudes in Australian-Japan (120-150°E) longitudes and a negative ionospheric storm in American (60-120°W) longitudes. The Cluster spacecraft and incoherent scatter radar (EISCAT and Jicamarca) observations showed mapping of magnetospheric electric fields to the high latitude ionosphere and its penetration to low latitudes. The strongest ever recorded penetration occurred on 09 November 2004, with an efficiency of about 10%. Using the Sheffield University Plasmasphere Ionosphere Model (SUPIM), it is shown that the direct effect of the storm-time neutral wind (that raises the ionosphere to high altitudes of reduced chemical loss) is the main individual driver of positive ionospheric storms at mid to low latitudes; the downwelling effect of the wind (that makes the thermosphere richer in atomic concentration and poorer in molecular concentration) also contributes to the positive ionospheric storms at low latitudes. The upwelling effect of the wind (that makes the thermosphere richer in molecular concentration and poorer in atomic concentration) is the main individual driver of the negative ionospheric storms at mid latitudes, and the storm-time ionospheric electric field (both penetrating and disturbed dynamo) is the main individual driver of negative ionospheric storms, especially at low latitudes. The combined effect

of the different drivers that lead to positive and negative ionospheric storms is being studied using coupled upper atmosphere-ionosphere models.