

Impact of Ground Level Enhancement from Solar Cosmic Rays on 20 January 2005 - Results for Ozone and Ionosphere Effects

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The influences of major solar proton flare from 20 January 2005 on the ionized and neutral components in the middle atmosphere are analyzed in this work. This flare is accompanied by ground level enhancement of solar cosmic rays and strong geomagnetic storm with SSC on 22 January 2005 (Kp index reaches 8). Short-term variations along the ozone profiles are discussed. Ozone partial pressure measurements from the programme Halogen Occultation Experiment (HALOE), realized by the Upper Atmospheric Research Satellite (UARS), are used. The GOES-10 satellite obtained the data on high energy protons. All energetic intervals 0.8 - 4 MeV, 4 - 9 MeV, 9 - 15 MeV, 15 - 40 MeV, 40 - 80 MeV, 80 - 165 MeV, 165 - 500 MeV are used. Cosmic ray data from super neutron monitors: Kiel - Germany (54.9; 95.6 geomagnetic degree) and Potchefstroom - South African Republic (-27.3; -90.1 geomagnetic degree) are analyzed also. Statistical analysis with this big volume of data is accomplished. Correlation and cross-correlation analysis between ozone and particle data is made. Different behaviors of the ozone response in both hemispheres is obtained on the basis of these computations. The ionosphere results for the same period are obtained in the observatory Sofia - Bulgaria by means of A3 method. The minimal reflectance frequency f_{min} , which characterizes the state of the lower ionosphere, has unusual course. For complement the other ionospheric parameters are involved also. The present investigation is an example for complex analysis of solar and extra-terrestrial influence in the middle atmosphere.