Geophysical Research Abstracts, Vol. 7, 07415, 2005
SRef-ID: 1607-7962/gra/EGU05-A-07415

Combined Influences of Solar Energetic Particles and Geomagnetic Storms on the Stratospheric Ozone Profiles

P. Velinov, Y.Tassev
Solar-Terrestrial Influences Laboratory - BAS (pvelinov@bas.bg)

The investigation of combined effects of solar energetic particles (SEP) and geomagnetic storms with SSC on the behavior of the stratospheric ozone is one complex problem in solar-terrestrial relationships and Earth's ecosystem. By means of statistical analysis the influence of SEP and SSC on the ozone profiles is studied in this paper. The SEP data are onboard GOES-8 satellite. The ozone data are taken from HALOE (Halogen Occultation Experiment) on UARS (Upper Atmosphere Research Satellite) and geomagnetic data are characterized by daily Ap index and 3 - hour Kp index. ANOVA (ANalysis Of VAriance) and two-way MANOVA (Multiple ANalysis Of VAriance) was used to examine the impact of two factors: 1) the proton flux intensity and 2) the geomagnetic activity on the dependent variable "ozone mixing ratio", which characterizes the stratospheric ozone profiles. The examination was carried out with fixed levels of two other factors: a) the heights at which the "ozone mixing ratio" was recorded, i.e. 35 km, 30.2 km, 24.5 km, 18.4 km and b) the energetic intervals within which the proton flux was measured, i.e. E = 0.6 - 4.2 MeV, 4.2 - 8.7 MeV, 8.7 - 14.5 MeV, 15 - 44 MeV, 39 - 82 MeV, 84 - 200 MeV, and 110 - 500 MeV. Our goal is to determinate which factors dominate at different altitudes and for different energies. The analysis was performed for all combinations of levels of the factors a) and b) for which data were available. It was aimed at revealing which of the factors 1) and 2) were dominating with different combinations of the factors a) and b) with fixed levels. For this purpose a post hoc analysis was performed as well. The main results are as follows: factors 1) and 2) exert statistically significant impact on the dependent variable at all of the heights examinated, but not for all of the energetic intervals. Increase of the ozone mixing ratio was observed as a main effect of the proton flux intensity at heights 24.5 km and 18.4 km, but the analysis of the simultaneous acting

of factors 1) and 2) revealed a decrease of dependent variable at these heights. These effects indicate the existence of two different mechanisms of SEP and SSC impact on the ozone mixing ratio. A general regularity of the distribution of SEP and SSC impact on the ozone is its decrease with growing of the altitude. Another basic result is the production of ozone at 18.4 km during the solar proton flares, jointly with the process of ozone dissociation.