IAGA 97
Uppsala

Abstracts

8th Scientific Assembly of IAGA with ICMA and STP Symposia

energetic precipitating electrons during that event, to determine which regions of the mesosphere were most susceptible to particle bombardment. Furthermore, we have considered the spectral characteristics for the energy distribution of the precipitating electrons to develop a true global morphology including depth of penetration for the energy deposition. Altitude profiles and global maps will be presented to examine the significance of this event on perturbing the mesosphere. Simultaneously, we have studied the diurnal variability of mesospheric ozone before, during and following this event using data from the CLAES (Cryogenic Limb Array Etalon Spectrometer) and the MLS (Microwave Limb Sounder) instruments aboard UARS. We find that on a global scale, changes in ozone did not exceed magnitudes necessary to be observable through the statistical noise limits on either instrument.

Aug. 11, 1615-1630

Solar Proton Events Effects in the Polar Middle Atmosphere

L N Makarova, A V Shirochkov and Grigor'eva (Arctic and Antarctic Research Institute, St.- Petersburg 199397, Russia)

The data of meteorological baloons flights (ceiling up to 25 km) together with the rocket measurements in the polar middle atmosphere of both hemispheres were used for analysis of the atmospheric parameters variations during the solar proton events (SPE's) in 1986-1990. It was found that the polar middle atmosphere exactly responds to the fluxes of the solar protons. This reaction depends on the fluxes intensity and it is more evident during winter period. The most dramatic changes in the atmosphere thermal regime occur at the height interval 40-60 km where temperature increase can be as high as 30-40 C. Such warmings cause significant changes of the horizontal wind structure in the lower stratosphere and interrupt previous order of the planetary waves propagation. It was also found that the regular spring rebuilding of the stratospheric circulation mode begins earlier at 10-14 days if its start occurs during the SPE active phase. Of course,the solar proton fluxes change the ozone concentration in the middle atmosphere.

Aug. 11, 1630-1645

Atmospheric Electricity and Lower Ionosphere Disturbances

O F Tyrnov, S I Martynenko, Yu B Milovanov, V T Rozumenko and A M Tsymbal (Department of Space Radio Physics, Kharkiv State University, 4 Svobody Sq., Kharkiv 310077, Ukraine)

Powerful sources of energy of different nature (earthquakes, explosions, meteorological features, particle precipitation, launch and flights of space vehicles, release of chemical reagents, high-power radio frequency radiation, etc.) cause local and large-scale disturbances in ionospheric plasma but on the other hand, recently discovered large atmospheric electric field strengths at lower ionosphere heights can substantially affect atmosphere-ionosphere-magnetosphere coupling processes. Because of the latter, this work studies the influence of large atmospheric electric field strengths on the development of disturbances in the lower ionosphere.

For the development of models of disturbances, it was used matrix representation of characteristic time and space scales as well as of the processes of transfer in the disturbed lower ionosphere. Then the equations describing coupling between space and time scales were written out, and a model of disturbances was constructed using multiscale expansion method.

Experimental investigations of disturbances taking into account electric field effects in the midlatitude lower ionosphere were performed over the years 1975-1995 with a Kharkiv State University partial reflection facility. The data consists of extraordinary and ordinary mode noise and signal plus noise measured concurrently with a height resolution of 3 km within an altitude range of 60 to 105 km and with a radar interpulse period of 1 s for each of the magnetoionic modes (operation frequencies were within a 1.8-3.9 MHz range).

Comparison of experimental data with output from the model showed that in many cases variations in electric field strengths substantially affect the development of transient disturbance in parameters of the lower ionosphere.

Acknowledgments. The authors have been supported by Science and Technology Center in Ukraine Grant N471.

Aug. 11, 1645-1700

On Strong Thunderstorms Affecting the Ionospheric D-Region Parameters, Characteristics of Noise and Partially-Reflected Signals

A M Gokov and O F Tyrnov (Department of Space Radio Physics, Kharkiv State University, 4 Svobody Sq., Kharkiv 310077, Ukraine)

In the paper there are given results of our experimental investigation of possible effects of strong thunderstorms on the middle latitude ionospheric D-region parameters and characteristics of sounding SW radio waves by means of the partial reflection and vertical sounding (ionosonde) techniques. The total number of observation series having duration of 1-10 hr over the periods of strong thunderstorms was 26.

Analyzing the experimental data has allowed to find the following features.

1. Over the periods of strong thunderstorms at $z = 87$-105 km, the occurence probability of sporadic layers becomes 2-4 times larger;

2. Strong thunderstorms may cause in the atmosphere infra-acoustic waves with $f>0.5$ Hz, which penetrate into the lower ionosphere with their vertical velocities being $V>300$ m/sec;

3. For thunderstorms in the lower D-region ($z<70$ km) in 40% of the events, the background ionization has been found to become several times larger up to $N<(500$-$700)$ cm-3 ;

4. In the upper D-region ($h>75$ km), no marked ($>30\%$) changes in N during thunderstorms have been found;

5. The electron-molecule collision frequency v at $z=63$ km for some events has become 1.7-1.8 times larger if compared with that for the undisturbed conditions.

Possible reasons of such changes in N and v at $z<70$ km may be precipitation of charged particles from the magnetosphere or variations of the ionosphere electric potential due to changes in the near-Earth atmosphere, conditioned by the strong thunderstorms.

Acknowledgments. The authors have been supported by Science and Technology Center in Ukraine Grant N471.

Aug. 11, POSTER #01

Electric Field Intencity Measurements Using the Partial Reflection Technique

A M Gokov, S I Martynenko and O F Tyrnov (Department of Space Radiophysics, Kharkiv State University, 4 Svobody Sq., Kharkiv, Ukraine)

It is well known that the presence of electric fields in the lower ionosphere can lead to sufficient changes in its parameters. Our experimental results have shown that a possible cause for the apparence of big enough electron collision frequency variations is the influence of atmospheric electric field. This fact gives a chance to measure the electric field in the lower ionosphere using the partial reflection technique.

During 1978-1995 there were investigated variations of the effective electron collision frequency in the ionospheric D-region in different geliogeophysical conditions by means of the partial reflection technique (operational frequency of the partial reflection facilities was $f=1.8$- 3.0 MHz, pulse length 25 mks , pulse repetition frequency $F=1$ Hz). The differential absorption of ordinary and extraordinary modes was neglected at the altitudes 60-66 km. The signal-to-noise ratio was more than 5. The total number of records has exceeded 170 (the partial reflection amplitude records duration was 10-15 min).

It was obtained the distribution of the effective electron collision frequency changes at the altitudes 60-66 km (the error of determining the collision frequency in these heights interval was $< 50\%$). It was developed the technique for estimating