EUROPEAN
GEOPHYSICAL
SOCIETY

European Geophysical Society

Annales Geophysicae

Part III
Space & Planetary Sciences

Supplement III to Volume 16

INTRADIURNAL OSCILLATIONS IN ANTARCTIC LOWER THERMOSPHERE WINDS: SOUTH POLE OBSERVATIONS AND GLOBAL IMPLICATIONS

J. M. Forbes (1), S. Palo (1), Yu. I. Portnyagin (2), N. A. Makarov (2) and E.G. Merzlyakov (2)
(1) Depártment of Aerospace Engineering Sciences, Campus Box 429, University of Colorado, Boulder, CO 80309-0429 U.S.A., (2) Institute for Experimental Meteorology, Scientific Production Association TYPHOON, Obninsk, Russia.
forbes@zeke.colorado.edu

Meteor radar wind measurements were made from the South Pole from January 19, 1995 through January 26, 1996, and from November 21, 1996, through January 27, 1997. The radar measures meridional wind speeds in four volumes of space located near 95 km altitude, 88 deg latitude, and along the 0, 90E, 90W and 180 deg longitude meridians. Observed intradiurnal oscillations which are westward-propagating with zonal wavenumber one fall into two classes: (a) a 12-hour oscillation which dominates during non-winter months; and (b) shorter-period oscillations which appear only during the winter. During the austral winter of 1995, six intradiurnal wave "events" occurred which met our statistical significance criterion. Wave periods ranged between about 7.0 and 10.5 hours, with wave amplitudes ranging between 10 and 15 m/sec. These events are examined in detail, and numerical simulations using the Global Scale Wave Model are presented which provide some indication of the latitudinal and vertical extent of the oscillations.

ENHANCED ION ACOUSTIC FLUCTUATIONS AND ION OUTFLOWS IN THE UPPER IONOSPHERE

F. Forme and D. Fontaine
CETP/UVSQ/IPSL, France.
francois.forme@cetp.ipsl.fr/Fax: [33] 139 254 919

Number of observations showing enhanced ion acoustic echoes observed by mean of incoherent scatter radar have been reported in the litterature. The received power is extremely enhanced up to 1 or 2 orders of magnitude above usual values, and it is mostly contained in one of the two ion acoustic lines. This spectral asymmetry and the intensity of the received signal cannot be resolved by the standard analysis procedure and often cause its failure. As a result, and in spite of a very clear spectral signature, the analysis is unable to fit the plasma parameters inside the regions of ion acoustic turbulence. Enhanced ion acoustic fluctuations are associated with ; enhanced electron temperature and large field-aligned bulk ion outflows from the topside ionosphere Although unavailable from the standard analysis procedure, the plasma description inside turbulent regions remains a crucial information to understand the ion acceleration process related to enhanced ion acoustic echoes. We will present in this talk European Incoherent Scatter radar EISCAT observations of large ion outflows associated with the simultaneous occurence of enhanced ion acoustic echoes. From the very clear spectral signatures of this echoes, a method will presented to extract some kind of estimates or informations on the plasma. Finally, estimates of the electron temperature and of the ion drift are used to study the possible implications on the plasma transport inside turbulent regions.

A NEW UPSHIFTED SPECTRAL STRUCTURE IN STIMULATED ELECTROMAGNETIC EMISSION SPECTRA, OBSERVED BETWEEN ELECTRON CYCLOTRON HARMONICS

V.L. Frolov, E.N. Sergeev (Radiophysical Research Institute, B. Pecherskaya Str. 25, Nizhny Novgorod, 603600, Russia)
P. Stubbe (Max-Planck-Institut für Aeronomie, D-37191 Katlenburg-Lindau, Germany)

We present detailed experimental results concerning features of the broad upshifted structure (BUS) which extends in the stimulated electromagnetic emission spectra up to $90 - 170$ kHz above the pump wave frequency. The BUS properties have been studied in the frequency range between the 3rd and 5th electron cyclotron harmonics ($f_{ce} \simeq 1350$ kHz in our measurements). It is observed that the generation of the BUS occurs in the pump frequency ranges from 4.3 MHz to 4.8 MHz and from 5.55 MHz to 6 MHz, with a maximum intensity at about 4.55 MHz and 5.6 MHz, respectively. The BUS is found to be induced in the vicinity of the upper hybrid resonance level for the pump wave. The threshold pump power for the BUS generation is about 5 MW ERP. The dependence of the BUS spectral features on the pump frequency and pump power, as well as their temporal development and decay under different ionospheric conditions, are investigated. The experiments were performed at the Sura heating facility ($56°N, 46°E$, Nizhny Novgorod, Russia) by modification of the ionospheric F region using a HF ordinary mode pump wave.

TWO COMPONENT NATURE OF BROAD UPSHIFTED MAXIMUM EMISSION FROM THE HF MODIFIED IONOSPHERE

V.L. Frolov, L.M. Kagan, E.N. Sergeev (Radiophysical Research Institute, B. Pecherskaya Str. 25, Nizhny Novgorod, 603600, Russia)
P. Stubbe (Max-Planck-Institut für Aeronomie, D-37191 Katlenburg-Lindau, Germany)

We have studied at the Sura heating facility ($56°N, 46°E$, Nizhny Novgorod, Russia) the structure of the BUM emission in the SEE spectrum and found that the BUM includes two different components, BUM_1 and BUM_2. Generation of the BUM_1 occurs when the pump frequency, f_0, is in the immediate vicinity of the electron cyclotron harmonic, that is for $\delta f \equiv f_0 - 4f_{ce} = -20$ to $+60$ kHz. Its intensity is highest for $\delta f \simeq 0$. This component is characterized by a weak dependence of its peak frequency, Δf_{BUM_1}, on the pump frequency f_0. In contrast, the peak frequency of the BUM_2 significantly increases with f_0, approximately satisfying the equation $\Delta f_{BUM_2} = \delta f$ for $\delta f \geq 40$ kHz, while for smaller δf this dependence may be weaker. The BUM_2 peak intensity has its highest value for $\delta f \simeq 30 - 40$ kHz, where the occurrence of multiple maxima (up to three, as a rule) is observed in the spectra. We find that the BUM_2 is generated in the vicinity of the upper hybrid resonance level, i.e., where the local upper hybrid frequency, $f_{uh} = (f_{pe}^2 + f_{ce}^2)^{1/2}$, equals the pump frequency f_0.

FIELD-ALIGNED ION FLOW EVENTS FROM THE IONOSPHERE OBSERVED BY THE EISCAT VHF RADAR

R. Fujii (1), M. Endo, Y. Ogawa, S. C. Buchert, S. Nozawa (1) and S. Watanabe, N. Yoshida (2)
(1) Solar-Terrestrial Environment Laboratory, Nagoya University, Chikusa-ku, Nagoya 464-0814, JAPAN, (2) Department of Geophysics, Tohoku University, JAPAN.
rfujii@stelab.nagoya-u.ac.jp/Fax: [81] 52 789 4311

We have determined statistically the spatial distribution of field- aligned ion flows and their temporal developments by using Common Program-7 (CP-7) data obtained from the EISCAT VHF radar system at Tromsø, Norway. Tromsø is located mostly in the closed magnetic field line region. We have found that field-aligned ion flows are sporadic phenomena and both ion outflows and inflows occur at all MLTs, but ion outflows dominate over ion inflows in terms of their occurrence and velocities. Representative samples of these ion outflow/inflow events indicate that ion momentum is not solely determined by effective (ambipolar) ion pressure gradient, gravity force, neutral friction and inertia.

VARIATIONS IN THE ELECTRON COLLISION FREQUENCY AND ELECTRIC FIELDS IN THE LOWER IONOSPHERE AT MIDDLE LATITUDES

A. M. Gokov (1), S. I. Martynenko (1), V. T. Rozumenko (1), A. M. Tsymbal (1) and **O. F. Tyrnov** (1)
(1) Kharkiv State University, Kharkiv, Ukraine.
Oleg.F.Tyrnov@univer.kharkov.ua

The analysis of measurements made by the partial reflection technique at the lower edge of the ionosphere has provided the distribution of effective electron collision frequency magnitudes derived with taking into account the kinetic effects. An assumption is made that this distribution is affected during periods of strong electric fields. A new technique for deriving these electric fields from the data on effective electron collision frequencies is developed. The results of investigations of electric fields obtained from this technique during 1978 to 1997 at Kharkiv State University are presented. The authors have been supported by STCU Grant 471.