PEM007-01   :202   :5   27   08:50-09:10

Transport and Energization of O+ Ions in the Near-Earth Magnetosphere
Transport and Energization of O+ Ions in the Near-Earth Magnetosphere

Shinichi Ohtani[1]*, Masahito Nose[2]
Shinichi Ohtani[1]*, Masahito Nose[2]

[1]The Johns Hopkins University APL, [2]Kyoto University
[1]The Johns Hopkins University APL, [2]Kyoto University

We discuss the energization and transport of energetic O+ ions in the night-side magnetosphere with an emphasis on geomagnetically active periods. The oxygen ENA flux from the storm-time ring current increases simultaneously with substorm activity, which suggests that this ENA flux enhancement is caused by the energization of local O+ ions rather than by the transport/injection of O+ ions from farther down the tail. Thus the transport of the O+ ions is a crucial issue for better understanding storm dynamics. In the present study we address this issue by statistically comparing the characteristics of energetic protons and O+ ions in the nightside magnetosphere. Energetic ion flux measurements made by the Geotail/EPIC instrument are used. The results are summarized as follows: (1) Whereas the average proton energy does not change significantly during a solar cycle, the average O+ energy is lower during solar maximum and higher during solar minimum; (2) The O+-to-proton ratios of the number density and energy density are several times higher during solar maximum than during solar minimum; (3) The average proton and O+ energies and the O+-to-proton ratios of number and energy densities all increase with geomagnetic activity. The solar phase dependence of the average proton energy is found only for geomagnetically active times and it is higher during solar minimum. The differences of other quantities among different solar phases not only stay but also increase with geomagnetic activity. (4) Whereas the average proton energy increases toward Earth, the average O+ energy decreases toward Earth. The average energy increases toward dusk for both the protons and O+ ions; (5) The O+-to-proton ratios of number density and energy density increase toward Earth during all solar phases but most clearly during solar maximum. These results suggest that the effects of geomagnetic activity and solar illumination on the ionospheric ion outflow are synergetic rather than additive and that a significant portion of O+ ions is transported directly from the ionosphere to the near-Earth region rather than through the distant tail.

: Oxygen ions, Ring current, Plasma sheet, Magnetospheric Storm, Ion outflow, Solar Cycle
Keywords: Oxygen ions, Ring current, Plasma sheet, Magnetospheric Storm, Ion outflow, Solar Cycle

Non-adiabatic ion acceleration in the Earth's inner magnetosphere on a substorm time scale

[1]*, Pontus C. Brandt[2],   [2], Donald G. Mitchell[2],   [3]
Kunihiro Keika[1]*, Pontus C. Brandt[2], Shinichi Ohtani[2], Donald G. Mitchell[2], Masahito Nose[3]

[1]   ,[2]   ,[3]
[1]New Jersey Institute of Technology, [2]JHU/APL, [3]Graduate School of Science, Kyoto Univ.

In order to investigate non-adiabatic ion acceleration in the Earth's inner magnetosphere on a short time scale (<30min) and its contribution to ring current development, we examine the temporal variations of energy spectra of energetic neutral atoms (ENAs) during substorms that occur in the storm main phase. ENAs are detected by the High Energy Neutral Atom (HENA) imager onboard the Imager for Magnetopause-to-Aurora Global Exploration (IMAGE) satellite. The ENA energy used in the present study ranges from 10 keV to 198 keV for hydrogen and from 29 keV to 222 keV for oxygen. We use ENA data obtained from two independent areas of a HENA image, for which HENA line-of-sights pass through the inner magnetosphere (˜-6 RE<X<˜-3 RE around the magnetic equator) and the outer magnetosphere (X<˜-6 RE around the magnetic equator).

Case studies for three substorms on 21 October 2001 and two substorms on 19 March 2002 [Keika et al., 2010, JGR] showed that (1) the oxygen ENA flux displays 20 to 30-min bursts during all substorms, while the hydrogen ENA flux did not increase or less significantly increased than the oxygen flux; (2) the temporal evolution of energy spectra is mass dependent for all examined substorms; (3) for two of the substorms, the oxygen flux ratio between before and after a substorm increases with increasing energy, indicating the hardening of an O+ energy spectrum; and (4) the flux ratio for the inner image area is comparable to or higher than that in the outer area. The results confirm that nonadiabatic acceleration with regard to the first adiabatic invariant did occur in the near-Earth magnetotail (X>-8 RE) and that the acceleration is mass-dependent.

This paper presents statistical results of the energy spectral evolution during storm-time substorms that occur in 2001 - 2003. We study how frequently, in which storm phase, and under what solar wind and magnetospheric conditions the non-adiabatic acceleration occurs. We then discuss for what energies/species the violation of the first adiabatic invariant occurs and what field variations/fluctuations cause such non-adiabatic acceleration.

- O^+

Search for "oxygen torus" in the deep inner magnetosphere - Possible source of O^+-rich ring current

[1]*,   [2], R. R. Anderson[3], H. J. Singer[4]
Masahito Nose[1]*, Kazue Takahashi[2], R. R. Anderson[3], H. J. Singer[4]

[1]   , [2]JHU/APL, [3]University of Iowa, [4]NOAA
[1]Kyoto University, [2]JHU/APL, [3]University of Iowa, [4]NOAA Space Weather Prediction Center

Previous studies, employing the RIMS instrument onboard the DE-1 satellite, report that a large amount of thermal O^+ ions exist in the outer plasmasphere (L=2.0-5.0) [Horwitz et al., 1984, 1986; Roberts et al., 1987; Comfort et al., 1988; Fraser et al., 2005], in a region called "the oxygen torus". These thermal O^+ ions can be observed frequently, even during low Kp periods (Kp=0-2+), in the late evening hours. Since the termination of the DE-1/RIMS operation about 25 years ago, there have been no instruments that make direct measurements of the oxygen torus, because of difficulty in measuring thermal ion flux with mass and charge state information.

In this study, we intend to detect the oxygen torus with an indirect method using the magnetic field data and the plasma wave data obtained by the CRRES satellite. We estimate the magnetospheric local mass density (rho) from the frequency of the toroidal standing Alfven waves. The local electron number density (n_e) is derived from the plasma wave spectra. Combining these two quantities makes it possible to infer the local average ion mass (M=rho/n_e). We find that M is approximately 3 in the outer magnetosphere (or the plasma trough), while it sometimes shows an enhancement to 5-15 around the plasmapause. This implies the existence of the oxygen torus near the plasmapause. The above method, adopting the toroidal wave frequency, can be considered a powerful tool to detect the oxygen torus and to examine the ion mass in the inner magnetosphere.

A recent study by Nose et al. [2010] presumed that the preexisting thermal O^+ ions in the oxygen torus are locally and nonadiabatically accelerated by fluctuations associated with dipolarization in the deep inner magnetosphere, resulting in formation of the O^+-rich ring current. We will also discuss analysis results of CRRES data in the context of the oxygen torus as an important source of the O^+-rich ring current.

PEM007-04   :202   :5   27   09:40-09:55

Estimation of temporal evolution of the plasmasphere using IMAGE/EUV data

[1], Fok Mei-Ching[2], C:son Brandt Pontus[3],   [1*]
Shin'ya Nakano[1], Mei-Ching Fok[2], Pontus C:son Brandt[3], Tomoyuki Higuchi[1*]

[1]   , [2]NASA Goddard Space Flight Center, [3]JHU APL
[1]The Institute of Statistical Mathematics, [2]NASA Goddard Space Flight Center, [3]JHU APL

In order to model the dynamics of the plasmasphere, it is important to know the spatial structure of the electric potential. However, it is generally difficult to directly measure the electric potential distribution. Thus, it is a challenge to grasp the temporal evolution and the dynamics of the plasmasphere. Aiming at providing a comprehensive picture of the dynamics of the plasmasphere, we are developing a data assimilation technique which incorporates remote imaging data of extreme ultra-violet (EUV) from the IMAGE satellite into a simulation model of the plasmasphere. In this technique, an initial state of the plasmasphere is guessed via an inversion of the EUV data. The temporal evolution of the plasmasphere is then estimated by incorporating a sequence of EUV data into a numerical simulation model initiated with the guess of the initial state. This technique treats the magnetospheric electric potential distribution as unknown. The electric potential distribution thus can also be estimated in the course of the assimilation process.

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Keywords: plasmasphere, data assimilation, inner magnetosphere, particle filter

Global Scale Ring Feature Electric Fields Raised in Plasmasphere

[1*]

Hiroshi Oya[1*]

[1]

[1]Science Department, Tohoku University

1.Introduction

For long periods in study fields of the plasmasphere , a regime to understand the plasmasphere as quiet features of the plasma distribution has been accepted. That is, the plasma is filled by transportation from the ionosphere and lost by magnetospheric convection which control the formation of the plasmapause being associated with corotation of the plasmasphere.

The observation results of plasmaspheric plasma distribution by the Akebono satellite, however, are revolutionarily changing the previously formed concept of the plasmasphere dynamics that is based on the convection ?refilling processes of the plasma. We here propose a extremely dynamical feature of plasma dynamics in the plasmasphere including behavior of the high energy particles in the inner magnetosphere by presenting new concept called the betatron drift that is caused by global scale ring feature electric fields raised in the periods of magnetic storms.

2.Evidences of Dynamical Motion of Plasmaspheric Plasma

After the launching of the Akebono satellite in February 1989, in the semi-polar orbit with initial apogee of 10500km, the PWS experiments on board the satellite havecurrently provided plasma density which are deducted from the detected upper hybridfrequency surrounding the spacecraft(Oya et al, 1991). One of remarkable results forlong term observations of plasma distribution in the plasmasphere are storm time behaviors of the plasma distribution which suggest the exodus and immigration of the plasma between plasmasphere and outer magnetosphere. That is, in the main phase of the magnetic storm, the plasmaspheric plasma moves towards the outer magnetosphere and the plasmapause is disappeared while the hot plasma in the outer magnetosphere moves deep inside plasmasphere.

The behavior of the movement of the plasma is explained as results of betatron drift which are caused by the global scale ring feature electric fields generated by the induction effects of the time varying ring currents. In the time of growing ring currents during the main phase of the magnetic storm, the plasma start to move towards outside by ExB effect with the ring feature electric fields having unti-clock wise sense, observed from the north pole, while the plasma drifts inwards by the ring feature electric fields which show clock wise sense. The existence of these global scale ring feature electric fields indicate the temporal violation of the MHD condition in the plasmasphere. For the underlying physics of this violation of the MHD condition we consider the microscopic processes caused by the local plasma waves that impede the free movement of electrons.

3. Effects of Betatron Drifts on High Energy Particles in the Inner Magnetosphere

Interaction modes of high energy particles to plasmaspheric plasma are understood to be two holds depending on the energy range. An apparent effects are made by group of ring current particles. The time varying feature results in the time varying ring current; therefore distribution of these group of particles contros the movement of plasma in the plasmasphere. The particles with higher energy but fewer flux than the ring current forming group of the energetic particles show the same tendency of drifts with warm plasma in the plasmasphere. Thus, we can give the interpretation for the storm time behavior of high energy group particles ,with energy larger than 500keV, in the inner magnetosphere as results of the betatron drifts that are caused by global scale ring feature electric fields.

.Reference

Oya, H., Studies on plasma and plasma waves in the plasmasphere and auroral particle acceleration region by PWS on board the EXOS-D(Akebono) Satellite, J. Geomag, Geoelectr.,43, Supple 369-393,1991.

Oya, H., Effects of Betatron drift on plasmasphere and plasmapause verified by the Akebono(EXOS-D) satellite observations, Advances in Solar-Terrestrial Physics edited by H.,Oya,145-175, Terapub,Tokyo 2004.

PEM007-06   :202   :5   27   10:10-10:25

Simulation of Electromagnetic Ion Cyclotron Triggered Emissions in the Earth's Inner Magnetosphere

[1*],   [1]

Masafumi Shoji[1*], Yoshiharu Omura[1]

[1]

[1]RISH, Kyoto University

In a recent observation by the Cluster spacecraft, electromagnetic ion cyclotron (EMIC) triggered emissions were discovered in the inner magnetosphere. We perform hybrid simulations to reproduce the EMIC triggered emissions. We develop a self-consistent one-dimensional (1D) hybrid code with a cylindrical geometry of the background magnetic field. We assume a parabolic magnetic field to model the dipole magnetic field in the equatorial region of the inner magnetosphere. Triggering EMIC waves are driven by a left-handed polarized external current assumed at the magnetic equator in the simulation model. Cold proton, helium, and oxygen ions, which form branches of the dispersion relation of the EMIC waves, are uniformly distributed in the simulation space. Energetic protons with a loss cone distribution function are also assumed as resonant particles. We reproduce rising tone emissions in the simulation space, finding a good agreement with the nonlinear wave growth theory. In the energetic proton velocity distribution we find formation of a proton hole, which is assumed in the nonlinear wave growth theory. A substantial amount of the energetic protons are scattered into the loss cone, while some of the resonant protons are accelerated to higher pitch angles, forming a pancake velocity distribution.
Keywords: EMIC wave, Triggered emission, Hybrid simulation, Inner magnetosphere, nonlinear wave growth

PEM007-07   :202   :5   27   10:45-11:05

The Roles of Transport and Wave-Particle Interactions on Radiation Belt Dynamics

Mei-Ching Fok[1*], Alex Glocer[1], Qiuhua Zheng[1]
Mei-Ching Fok[1*], Alex Glocer[1], Qiuhua Zheng[1]

[1]NASA Goddard Space Flight Center, USA
[1]NASA Goddard Space Flight Center, USA

Particle fluxes in the radiation belts can vary dramatically during geomagnetic active periods. Transport and wave-particle interactions are believed to be the two main types of mechanisms that control the radiation belt dynamics. Major transport processes include substorm dipolarization and injection, radial diffusion, convection, adiabatic acceleration and deceleration, and magnetopause shadowing. Energetic electrons and ions are also subjected to pitch-angle and energy diffusion when interact with plasma waves in the radiation belts. Important wave modes include whistler mode chorus waves, plasmaspheric hiss, electromagnetic ion cyclotron waves, and magnetosonic waves. We investigate the relative roles of transport and wave associated processes in radiation belt variations. Energetic electron fluxes during several storms are simulated using our Radiation Belt Environment (RBE) model. The model includes important transport and wave processes such as substorm dipolarization in global MHD fields, chorus waves, and plasmaspheric hiss. We discuss the effects of these competing processes at different phases of the storms and validate the results by comparison with satellite and ground-based observations.

       : Radiation Belts, Space Weather, Wave-Particle Interaction, Storm and Substorm
Keywords: Radiation Belts, Space Weather, Wave-Particle Interaction, Storm and Substorm

PEM007-08   :202   :5   27   11:05-11:25

Numerical Estimates of Outer Radiation Belt Electron Flux Dropouts during Geomagnetic Storms

Kyung-Chan Kim[1][*], Dae-Young Lee[2], Hee-Jeong Kim[3], Ensang Lee[4], Cheong-Rim Choi[5], Yuri Shprits[1]
Kyung-Chan Kim[1][*], Dae-Young Lee[2], Hee-Jeong Kim[3], Ensang Lee[4], Cheong-Rim Choi[5], Yuri Shprits[1]

[1]IGPP/UCLA, USA, [2]Chungbuk National University, Korea, [3]AOS/UCLA, USA, [4]Kyung-Hee University, Korea, [5]KAIST, Korea
[1]IGPP/UCLA, USA, [2]Chungbuk National University, Korea, [3]AOS/UCLA, USA, [4]Kyung-Hee University, Korea, [5]KAIST, Korea

Satellite observations often show that relativistic electron fluxes that decrease during a geomagnetic storm main phase do not recover their pre-storm level even when the storm has substantially recovered. A possible explanation for such sustained flux dropout is that the electrons that move to larger shells (L shells) aided by the Disturbance Storm Time (Dst) effect associated with the main phase geomagnetic field depression may be suffering drift-lost to the magnetopause, resulting in irreversible (non-adiabatic) flux decreases during a geomagnetic storm. In addition, a possible radial diffusion can be induced after there is a drift loss at outer L-shells during the storm main phase, which then can redistribute the remaining particle fluxes during the storm recovery. In this study, we numerically evaluate the drift loss effect by combining it with the Dst effect and including off-equatorially mirroring electrons for three different storm conditions obtained by averaging 95 geomagnetic storms that occurred from 1997 to 2002. Using the Tsyganenko T02 model and our own simplified method, we estimate the storm time flux changes based on the guiding center orbit dynamics. Then by solving diffusion equations numerically, we investigate details of this diffusion process driven by the steep radial gradient across the trapping boundary after there is a fast drift loss during the storm main phase and its effectiveness in changing the particle flux level during the storm recovery. We also examine the radial diffusion process by comparing it to the results based on the combined adiabatic Dst and drift loss.

: Outer radiation belt, Relativistic electrons
Keywords: Outer radiation belt, Relativistic electrons

PEM007-09 :202 :5 27 11:25-11:40

JAXA
ENERGETIC ELECTRON DYNAMICS IN THE INNER MAGNETOSPHERE INFERRED FROM JAXA SATELLITE OBSERVATIONS

[1]*, [1]

Takahiro Obara[1]*, haruhisa matsumoto[1]

[1]

[1]Japan Aerospace Exploration Agency

In order to investigate space environment and its temporal variation, JAXA has been installing radiation particle detectors on LEO satellites (GOSAT, ALOS, Jason-2), GEO satellites (ETS-V, DRTS), GTO satellites (ETS-VI, MSD-1) and Quasi zenith orbiting satellite (QZS-1). With these radiation particle data, some distinguished sciences of energetic electrons have been obtained. Intensity of highly energetic (MeV) electrons in the outer radiation belt increases drastically during the magnetic storms in a very wide region from L~3 to L~8. Increase of MeV electrons in the outer radiation belt (L~3 to L~8) seems to be controlled by solar wind velocity as well as magnetic activities. Seasonal variation of the increase in the intensity of MeV electrons was found with peaks of spring and autumn. This is understood as Russell-McPherron effect. With these relations, we have constructed an advanced (dynamic) outer radiation belt model, and compared it with observations. Strong injection or transportation of intermediate energy (40-100keV) electrons from the plasmasheet into the heart of outer radiation zone (L~4) was identified during the major and big storms. These intermediate energy electrons should be seeds of highly energetic (MeV) electrons in the outer radiation belt. Thus means that seed electrons should be accelarated internally in the outer radiation zone via wave particle interaction. It was found that MeV electrons penetrated into the inner radiation belt across the slot region during the big magnetic storm. We also found that low energy (40keV) electrons have been transported to very near Earth region; i.e. a few thousand km above sea level. We will make comparison with simulation results to interpret observations.

: , , JAXA
Keywords: Inner Magnetosphere, High Energy Electrons, JAXA Satellite Observation

PEM007-10 :202 :5 27 11:40-11:55

Simulation study on the evolution and propagation of whistler waves during storm time

[1]*, V. Jordanova[2], [1]
Yoshizumi Miyoshi[1]*, V. Jordanova[2], Yosuke Matsumoto[1]

[1] , [2]
[1]STEL, Nagoya University, [2]Los Alamos National Laboratory

In the inner magnetosphere, plasma waves play an essential role for cross-energy coupling processes of different plasma/particle populations via wave-particle interactions. In order to understand the temporal-spatial variation of whistler mode waves in the inner magnetosphere, we simulate the evolution of the electron distribution function and the linear growth rate due to the anisotropies with the RAM electron code [Jordanova and Miyoshi, 2005]. Since the linear growth rate depends on the ratio of the plasma frequency to the gyro-frequency, the intense whistler mode emissions are observed near the plasmapause. In fact, the simulation results for a magnetically active period indicate that whistler mode waves are generated from post-midnight to the dawn-side outside the plasmapause. On the other hand, we do not observe significant wave excitation inside the plasmapause, because hot electrons from the plasma sheet do not access inside the plasmapause. The three-dimensional ray-tracing study indicates that the whistler waves excited outside the plasmapause can propagate into the plasmasphere through multiple reflections at LHR resonance point. Therefore, one of the origin of plasmaspheric hiss is whistler mode waves generated outside the plasmasphere, as suggested by Bortnik et al.[2008].

: , , ,
Keywords: inner magnetosphere, whistler mode waves, simulation, cross-energy coupling

PEM007-11   :202   :5   27   11:55-12:10

Self-consistent particle simulation of whistler mode triggered emissions

[1]*,   [1], Summers Danny[2]
Mitsuru Hikishima[1]*, Yoshiharu Omura[1], Danny Summers[2]

[1]   , [2]Dept. of Math and Stats., Memorial Univ.
[1]RISH, Kyoto University, [2]Dept. of Math and Stats., Memorial Univ.

   Self-consistent electromagnetic particle simulations were performed to analyze whistler mode triggered emissions in the magnetosphere. Triggering whistler mode waves injected at the magnetic equator induces a nonlinear absolute instability that results in rising tone emissions similar to natural whistler mode chorus emissions. The triggering wave causes a depletion of resonant electrons at the resonance velocity. The phase-organized resonant electrons released by the triggering waves generate coherent waves that undergo nonlinear growth with increasing frequencies. The essential mechanism is the same as that for the generation of chorus emissions. Saturation of the nonlinear wave growth is caused by enhancement of resonant electrons at high pitch angles that have been trapped and guided along the resonance velocity by the triggered emissions. Because of the decreasing resonance velocity resulting from the increasing frequency, trapped electrons are accelerated to higher pitch angles. Saturation of the nonlinear wave growth thereby results in electron acceleration.

PEM007-12 :202 :5 27 12:10-12:25

SC VLF

Statistical analysis of energetic electron precipitation and VLF emissions at Syowa station during sudden commencements

Hiroyasu Tadokoro[1*], Yoshizumi Miyoshi[2], Hisao Yamagishi[1], Hiroshi Miyaoka[1], Yoshimasa Tanaka[1]

[1]National Institute of Polar Research, [2]Nagoya University

Sudden commencements (SC) are caused by a rapid increase of the dynamic pressure of the solar wind. To understand loss processes of energetic electrons during SC, we have examined VLF data at 750 Hz, 1.2kHz, and 2.0kHz from the VLF receiver and Cosmic Noise Absorption (CNA) data from the riometer, which reflects variations of energetic electron precipitation, at Syowa station (L=6.1). Statistical variations of CNA distributions as a function of magnetic local time (MLT) during 277 SC in 1999-2009 show that enhanced energetic electron precipitating region occurs at the noon side with time evolution of SC. VLF variations at 750Hz, and 1.2kHz are consistent with the CNA variations although those at 2.0kHz are not consistent with those. In addition to these characteristics of the VLF emissions and energetic electron precipitation during SC, solar wind parameters and electron temperature anisotropy will be discussed in this presentation.
Keywords: Syowa station, energetic electron, VLF emissions, SC, electron precipitation

PEM007-P01 : :5 27 15:00-16:15

GEMSIS-RB Wave

Wave-particle interaction between whistler chorus and high-energy electrons: GEMSIS-RB Wave simulation

[1*], [1], [1]

Shinji Saito[1*], Yoshizumi Miyoshi[1], Kanako Seki[1]

[1]

[1]STEL, Nagoya University

Scattering process of high energy electrons by whistler chorus in the dipole field is studied to understand electron microbursts associated with whistler chorus by using GEMSIS-RB Wave code. Whistlers are assumed to propagate parallel to the magnetic field, and typical whistler chorus parameters, such as wave frequency, frequency drift rate, and wave amplitude, are assumed based on the spacecraft observations. By using the observed parameters, the GEMSIS-RB Wave code calculates the wave-particle interactions between whistler chorus and the high-energy electrons bouncing along the dipole magnetic field. The code can calculate the precipitation loss of energetic electrons during a few days, considering the micro wave-particle interactions with a few msec. This study focuses on the high energy electron precipitation loss associated with the scattering by whistler chorus with realistic parameters, and applies to understand a physics of high energy electron microburst.

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Keywords: radiation belt, whistler chorus, wave-particle interaction

PEM007-P02   :   :5   27   15:00-16:15

Interactions between Oblique Whistler-Mode Waves and Energetic Electrons in the Earth's Radiation Belt

[1]*, David Nunn[2],   [1]
Yu Miyashita[1]*, David Nunn[2], Yoshiharu Omura[1]

[1]   , [2]ECS,
[1]RISH, Kyoto University, [2]ECS, University of Southampton

We analyze the mechanisms of interactions between oblique whistler-mode waves and energetic electrons in the Earth's radiation belt. By the dispersion relation of whistler-mode wave, we calculate the refractive index in relation to propagation angle. We find that higher propagation angle makes the refractive index larger. Taking into account the dispersion relation, we perform the test particle simulations of energetic electrons interacting with oblique whistler-mode chorus. The source particles are assumed to be evenly distributed in gyro-phase. We calculate the trajectories of all electrons and energy exchanges, changing initial parallel velocity. The exponential terms appeared due to oblique propagation, in which include trigonometric function are calculated by using Bessel functions. We analyze energy changes and magnetic moment changes of electrons in case of Landau resonance and cyclotron resonance.

PEM007-P03   :   :5   27   15:00-16:15

Dayside chorus waves under quiet solar wind conditions: PENGUIn/AGO and THEMIS conjugate observations

[1]*, Louis J. Lanzerotti[1],   [2], Maria Spasojevic[3], Vassilis Angelopoulos[4], Andrew J. Gerrard[1], Jeongwoo Lee[1], Kyungguk Min[1], Jacob Bortnik[5], Wen Li[5],   [5]
Kunihiro Keika[1]*, Louis J. Lanzerotti[1], Yoshizumi Miyoshi[2], Maria Spasojevic[3], Vassilis Angelopoulos[4], Andrew J. Gerrard[1], Jeongwoo Lee[1], Kyungguk Min[1], Jacob Bortnik[5], Wen Li[5], Yukitoshi Nishimura[5]

[1]   ,[2]   ,[3]   ,[4]
     ,[5]
[1]New Jersey Institute of Technology, [2]STEL, Nagoya Univ., [3]Stanford Univ., [4]IGPP, UCLA, [5]DAOS, UCLA

We study simultaneous observations of chorus waves in the magnetosphere and VLF waves in Antarctica on the dayside at high L-shells (L>7) under quiet solar wind conditions, using in-situ observations by THEMIS and ground-based VLF observations at automatic geophysical observatories (AGO) in Antarctica in the PENGUIn project. The scientific goal of this research is to identify where in magnetic latitude (MLAT), magnetic local time (MLT), and radial distance (or L-value) quiet-time dayside chorus waves can be preferably generated.

On 26 July 2008, the VLF receiver at the AGO P2 station (AP2: MLAT = -76.6 deg.) detected the intensification of VLF signals at the frequency range of 0.5-1.0 kHz between ˜1400 and ˜1700 UT. At the AGO P3 station (AP3: MLAT = -83.63 deg.), VLF signals increased at the 0.5?1.0 kHz frequency range between ˜1400 and ˜1800 UT; the increase rate was smaller than at AP2. The fluxgate magnetometer data confirmed that AP2 and AP3 were equatorward of the open-closed boundary.
During these intervals, THEMIS A, D, and E traveled in an outbound path at L = 7-10 and MLT = 11.5?13h. Both THEMIS A and D were magnetically conjugated to AP2 between ˜1600 and ˜1700 UT and to AP3 between ˜1430 and ˜1530 UT. THEMIS E was conjugated to AP2 between ˜1530 and ˜1630 UT. THEMIS A registered wave intensification at the frequency of 0.3 to 0.4 fce between ˜1330 and ˜1600 UT, where fce is the local electron gyrofrequency. THEMIS A wave burst data available during two intervals at ˜14UT confirm that the waves were circularly right-handed polarized. Filter bank data from THEMIS D and E show wave intensification in the 287-1240 Hz band at ˜1230 - ˜1530 UT and ˜1430 - ˜1630 UT, respectively.

Using the above-mentioned conjugate observations, we examine spatial distributions of chorus wave power and properties with respect to L and MLT. Our preliminary results imply that chorus wave power was more enhanced around noon than the dawn and dusk sides. We discuss what process(es) can explain such non-uniform wave power distributions under quiet solar wind conditions resulting in steady-state magnetospheric conditions, by simulating motion of energetic electrons in realistic 3D magnetic field and global convection electric field models. The simulation will also enable us to examine where in MLAT chorus waves are preferably generated.

Keywords: dayside chorus, conjugate observations, THEMIS, Antarctic research

PEM007-P04   :   :5   27   15:00-16:15

Magnetopause Shadowing THEMIS
Rapid flux losses of the outer belt electrons due to the magnetopause shadowing effect: THEMIS observations

[1*], [1], [1], [1], Vassilis Angelopoulos[2], J. P. McFadden[3], D. Larson[3], J. Koller[4]
Chiemi Matsumura[1*], Yoshizumi Miyoshi[1], Kanako Seki[1], Shinji Saito[1], Vassilis Angelopoulos[2], J. P. McFadden[3], D. Larson[3], J. Koller[4]

[1] , [2]UCLA/ IGPP, USA, [3]UCB/ SSL, USA, [4]Los Alamos National Laboratory, USA
[1]Solar-Terrestrial Environment Laboratory, [2]UCLA/ IGPP, USA, [3]UCB/ SSL, USA, [4]Los Alamos National Laboratory, USA

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Keywords: radiation belt, loss, inner magnetosphere, particle acceleration, solar wind - radiation belt interaction