Japanese URSI Commission H (Waves in Plasmas) Activity Report
February, 2013

Future Meetings

2. JpGU (Japan Geoscience Uniton) Meeting 2013, Makuhari, Japan, May 19-24, 2013.
3. AOGS(Asia Oceania Geosciences Society) 2013, Brisbane, Australia, June 24-28, 2013.
4. 11th International School/Symposium for Space Simulations (ISSS-11), Jhongli City, Taiwan, July 21-27, 2013.
5. IAGA 2013, Mérida, Yucatán, México, August 26-31, 2013.
6. AP-RASC 2013, Taipei, Taiwan, September 3-7, 2013.
7. COSPAR Symposium on "Planetary Systems of our Sun and other Stars, and the Future of Space Astronomy", Bangkok, Thailand, November 11-15, 2013.
8. International CAWSES (Climate and Weather of the Sun-Earth System)-II Symposium, Nagoya, Japan, November 18-22, 2013.

Recently Published Papers (Oct 2012 – Feb. 2013)

1. Ozaki, M., S. Yagitani, K. Takahashi, and I. Nagano, Dual-Resonant Search Coil for Natural Electromagnetic Waves in the Near-Earth Environment, IEEE Sensors Journal, vol.13, issue 2, pp.644-650, 2013.

A dual-resonant search coil (DRSC) is designed as a wideband magnetometer for natural electromagnetic waves in the near-Earth environment. Since the frequency response of a search coil is determined by its resonant frequency, its bandwidth can be increased by using multiple resonances. Two resonances are obtained by capacitive coupling with negative mutual inductance between two coils. The resulting measurement band of the DRSC is from 10 Hz to 1 MHz for a sensor 100 mm in length, 25 mm in diameter, and 0.11 kg in mass.

2. Fung, S. F., K. Hashimoto, H. Kojima, S.A. Boardsen, L.N. Garcia, H. Matsumoto, J.L. Green and B. W. Reinisch, Terrestrial Myriametric Radio Burst Observed by IMAGE and Geotail Satellites, J. Geophys. Res., DOI: 10.1002/jgra.50149, 2013

A terrestrial myriametric radio burst (TMRB) might be a distinct radiation of 12-50 kHz. The TMRB may have a fan beam-like radiation pattern emitted by a discrete, dayside

source located along the pole-ward edge of magnetospheric cusp field lines.

3. **Bayupati, I. P. A., Y. Kasahara, Y. Goto, Study of Dispersion of Lightning Whistlers Observed by Akebono Satellite in the Earth's Plasmasphere, IEICE Trans. Commun., E95-B(11), 3472-3479, 2012.**

When the Akebono (EXOS-D) satellite passed through the plasmasphere, a series of lightning whistlers was often observed by its analogue wideband receiver (WBA). Bayupati et al. (2012) analyzed two typical events representing the clear dispersion characteristics of lightning whistlers along the trajectory of Akebono. The observed trends of whistler dispersion were compared with the ones theoretically derived using a dipole geomagnetic field model and two types of electron density profiles. Bayupati et al. (2012) showed that the observed trends basically agree with the theoretical results and small deviation between them can be fitted by the optimization of electron density profile. This fact demonstrates that the dispersion analysis of lightning whistlers is a useful technique for reconstructing the electron density profile in the Earth's plasmasphere.

4. **Nishibe, M., Y. Goto, Y. Kasahara, Reduction of interference noises on wave spectrograms observed by the KAGUYA sapacecraft, IEICE Trans. Commun., J95-B(11), 1567-1575, 2012.**

The waveform capture (WFC) onboard the KAGUYA spacecraft is designed to measure natural plasma waves generated around the moon and radio emissions which propagate from the sun, the earth and other planets. In order to suppress the artificial noises originated from the instruments onboard KAGUYA, Nishibe et al. (2012) developed a new method to identify the relationship between each interference noise with the noise source and reduce the noise in a systematic way according to the house keeping data of the spacecraft.

5. **Matsuda, S., Y. Kasahara, Y. Goto, Study on onboard data processing for phase property of plasma wave measured by spacecraft, IEICE Trans. Commun., J95-B(11), 1584-1593, 2012.**

Data processing for plasma wave instrument onboard spacecraft shall be done under quite limited resources of CPU and memory. Matsuda et al. (2012) investigated an signal processing method to derive power spectrum and phase information of plasma wave applicable to onboard data processing. They proposed a more efficient processing method adopting high performance FFT routines according to pre-implemented tables

for trigonometric functions and demonstrated that the proposed method is fast enough to apply to the onboard data processing. They also evaluated the accuracy of calculation for phase properties of plasma wave signal even in the low-frequency resolution condition using vector averaging method.

6. **Shoji, M., and Y. Omura, Precipitation of highly energetic protons by helium branch electromagnetic ion cyclotron triggered emissions, J. Geophys. Res., VOL. 117, A12210, doi:10.1029/2012JA017933, 2012**

In the equatorial region of the Earth's inner magnetosphere, the electromagnetic ion cyclotron (EMIC) triggered emissions are generated through interaction with energetic protons. We investigate the generation process of the EMIC triggered emissions in the He+ branch and associated precipitation of the energetic protons using a one-dimensional hybrid simulation with a cylindrical parabolic magnetic geometry. The simulation results show a good agreement with the nonlinear wave growth theory.

7. **S. Kurita, Y. Katoh, Y. Omura, V. Angelopoulos, C. M. Cully, O. Le Contel,and H. Misawa, THEMIS observation of chorus elements without a gap at half the gyrofrequency, J. Geophys. Res., VOL. 117, A11223, doi:10.1029/2012JA018076, 2012.**

Using waveform data obtained by one of the THEMIS satellites, we report properties of rising tone chorus elements without a gap at half the gyrofrequency in a region close to the magnetic equator. The wave normal angle of the chorus elements is typically field-aligned in the entire frequency range of both upper-band and lower-band chorus emissions. We find that the observed frequency sweep rates are consistent with the estimation based on the nonlinear wave growth theory of Omura et al. (2008).

8. **Lee, K. H., Y. Omura, and L. C. Lee, Electron acceleration by Z-mode waves associated with cyclotron maser instability, Citation: Phys. Plasmas 19, 122902 (2012); doi: 10.1063/1.4772059.**

We demonstrate by a particle simulation that Z-mode waves generated by the cyclotron maser instability can lead to a significant acceleration of energetic electrons. In the particle simulation, the initial electron ring distribution leads to the growth of Z-mode waves, which then accelerate and decelerate the energetic ring electrons. The initial ring distribution evolves into an X-like pattern in momentum space, which can be related to the electron diffusion curves.

9. **Omura Y., D. Nunn, and D. Summers, Generation processes of whistler-mode chorus emissions: Current status of nonlinear wave growth theory, AGU Monograph "Dynamics of the Earth's Radiation Belts and Inner Magnetosphere", 10.1029/2012GM001347, 2012.**

We give a brief review of the nonlinear processes related to the generation mechanism of chorus emissions that have been revealed by the simulations or observations. We describe the nonlinear dynamics of resonant electrons and the formation of electromagnetic electron holes or hills that result in resonant currents generating rising-tone emissions or falling-tone emissions, respectively.

10. **Summers, D., R. Tang,and Y. Omura, Linear and nonlinear growth of magnetospheric whistler mode waves , 10.1029/2012GM001298, in Dynamics of the Earth's Radiation Belts and Inner Magnetosphere, Geophys. Monogr. Ser., vol 199, edited by D. Summers, I.R. Mann, D. N. Baker, and M. Schulz, pp.265-279, AGU, Washington, D.C., 2012.**

According to recently developed nonlinear cyclotron resonance theory, the generation of a whistler-mode rising-tone chorus element is determined by a pair of coupled nonlinear ordinary differential equations referred to as “chorus equations”. We generalize the chorus equations to an arbitrary energetic electron distribution, and calculate the associated threshold wave amplitude for sustained nonlinear growth.

11. **Miyoshi, Y., T. Ono, T. Takashima, K. Asamura, M. Hirahara, Y. Kasaba, A. Matsuoka, H. Kojima, K. Shiokawa, K. Seki, M. Fujimoto, T. Nagatsuma, C. Z. Cheng, Y. Kazama, S. Kasahara, T. Mitani, H. Matsumoto, N. Higashio, A. Kumamoto, S. Yagitani, Y. Kasahara, K. Ishisaka, L. Blomberg, A. Fujimoto, Y. Katoh, Y. Ebihara, Y. Omura, M. Nosé, T. Hori, Y. Miyashita, Y.-M. Tanaka, T. Segawa, and ERG Working Group, The Energization and Radiation in Geospace Project, 10.1029/2012GM001304, in Dynamics of the Earth's Radiation Belts and Inner Magnetosphere, Geophys. Monogr. Ser., vol 199, edited by D. Summers, I.R. Mann, D. N. Baker, and M. Schulz, pp.265-279, AGU, Washington, D.C, 2012.**

The Energization and Radiation in Geospace (ERG) project for solar cycle 24 will explore how relativistic electrons in the radiation belts are generated during space storms. This geospace exploration project consists of three research teams: the SPRINT-B/ERG satellite observation team, the ground-based network observation team, and the integrated data analysis/simulation team.