

reconnection events between ground-based magnetometer data and upstream satellite data.

### [VII-2-2] Harmonic plasma emission by electron beam - plasma interaction

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Electromagnetic radiation at the plasma frequency and its second harmonic, the so-called plasma emission, is fundamental process responsible for solar type II and III radio bursts. There have also been occasional observations of higher-harmonic plasma emissions in the solar-terrestrial environment. We will present that the simulation effort on characterizing the electron beam-generated plasma emission process at POSTECH. We have developed fully electromagnetic particle-in-cell (PIC) simulation code with three dimensions. We simulated harmonic plasma emission with various beam condition. Qualitative comparison with the traditional plasma frequency and second harmonic radiation theory is in good agreement. Higher harmonic emissions agree with the theory of coalescence of Langmuir and harmonic EM wave.

### [VII-2-3] Electron Microburst Generation by Wave Particle Interaction

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Electron microbursts are the intense electron precipitation which durations are less than one second. We measured the energy spectra of the microbursts from 170 keV to 340 keV with solid state detectors aboard the low-altitude (680km), polar-orbiting Korean STSAT-1 (Science and Technology SATellite). The data showed that the loss cone at these energies is empty except when microbursts abruptly appear and fill the loss cone in less than 50 msec. This fast loss cone filling requires pitch angle diffusion coefficients larger than  $\sim 10^{-2}$  rad<sup>2</sup>/sec, while  $\sim 10^{-5}$  rad<sup>2</sup>/sec was proposed by a wave particle interaction theory. We recalculated the diffusion coefficient, and reviewed of electron microburst generation mechanism with test particle simulations. This simulation successfully explained how chorus waves make pitch angle diffusion within such short period. From considering the resonance condition between wave and electrons, we also showed  $\sim 100$  keV electrons could be easily aligned to the magnetic field, while  $\sim 1$  MeV electrons filled loss cone partially. This consideration explained why precipitating microbursts have lower e-folding energy than

that of quasi-trapped electrons, and supports the theory that relativistic electron microbursts that have been observed by satellite in-situ measurement have same origin with  $\sim 100$  keV electron microbursts that have been usually observed by balloon experiments.

### [VII-2-4] Analysis of FUV auroras by high energy electron precipitation

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Our previous study showed the intensity of the long LBH (1600 - 1715 Å) was enhanced very much compared to that of the short LBH (1400 - 1500 Å) when the characteristic energy of the precipitating electrons increased from 1 keV to  $> 7$  keV, in accordance with the theoretical models. In this presentation, we would like to present the results of our study for new modeling results about previous report and even higher energy electrons. We selected the events in which the fluxes both in the low energy (100 eV  $\sim$  20 keV) and in the high energy (170  $\sim$  360 keV) were enhanced, and examined the auroral spectra for these events observed simultaneously by the imaging spectrograph on the same spacecraft. While the accurate characteristic energy could not be determined because of the gap in the energy range, our result showed the intensity ratio of the long LBH to the short LBH ranged from 1.2 to 2.0 in these events, in contrast to 1.0 or smaller for the events in which the highest enhancement was seen only in the low energy. Our study suggests that intense auroras might be accompanied by high energy electrons above 20 keV.

### [VII-2-5] 무거운 이온을 포함하고 있는 플라즈마에서 Pseudo-Potential Method와 1d PIC Simulation

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electron, ion, heavy ion으로 구성 된 plasma에서 hump type 과 kink type(double layer)의 electrostatic solitary waves이 존재할 수 있다는 것을 pseudopotential method를 이용한 결과와 1d PIC(Particle-In-Cell) simulation method의 결과에서 각각 확인하였다. 1d PIC simulation에서 초기에 각각의 입자 종(species; electron, ion, heavy ion)의 밀도섭동(density

perturbation)은 Gaussian 형태로 주었으며, 각각의 입자들의 drift velocity는 각각의 plasma 입자 종들의 thermal velocity로 나란한 방향으로 주었다.

**[VII-2-6] Identification of linearly unstable modes in the near-Earth current disruption**

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Identification of wave characteristics during current disruption events in the near-Earth geomagnetic tail region (~ 10 RE) is important to understand the substorm onset mechanism. In this paper, linear stability analysis in the ion-cyclotron frequency range, considering temperature anisotropy and cross-field flow is presented. It is found that the ion-cyclotron drift waves propagating in a quasi-perpendicular direction with respect to the ambient magnetic field are characterized by low frequencies ( $\omega < 0.5\Omega_{ci}$ ), while quasi-parallel waves have frequencies close to the ion-cyclotron frequency ( $\omega \sim \Omega_{ci}$ ). This finding is consistent with the observation by THEMIS spacecraft of a current disruption event in which a similar high- and low-frequency band structure is also present [A. T. Y. Lui, et al., J. Geophys. Res. 113, A00C06 (2008)]. It is also found that the quasi-perpendicular mode is excited by the ion cross-field flow.

**[VII-2-7] 보현산 지자기 자료를 이용한 일변화와 연변화 연구**

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한국천문연구원 태양우주환경연구그룹은 우주환경예·경보 연구에 활용하기 위하여 일본 Tierra Tecnica사의 RFP-523C 지자기 측정 시스템을 보현산천문대 태양망원경동에 구축하였다. 보현산 지자기 측정 시스템은 2007년 11월에 구축이 완료되어 현재 우주환경 변화에 의한 지자기 변화를 측정 및 저장하고 있다. 보현산 지자기 측정 시스템으로 측정된 지자기 자료를 사용하여 2008년부터 2009년 8월까지 보현산 지역의 지자기 일변화와 연변화를 연구하였다. 지자기 일변화와 연변화는 태양활동에 의한 영향을 받아 변화하는데, 지자기 일변화는 K 지수를 산출하는데 사용되고 지자기 연변화는 보현산 지역의 장기간 동안의 지자기 변동을 연구하는데 사용된다.

**■ Session : 과기위성**  
**10월 30일(금) 09:00 - 10:15 제3발표장**

**[(초)III-3-1] Discussion of Critical Design Review (CDR) for MIRIS, the Main Payload of STSAT-3**

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Ree<sup>1</sup>, Bongkon Moon<sup>1</sup>, Sung-Joon Park<sup>1,2</sup>, Sang-Mok Cha<sup>1</sup>, Jang-Hyun Park<sup>1</sup>, Duk-Hang Lee<sup>1,3</sup>, Nung Hyun Ka<sup>1</sup>, Mi Hyun Lee<sup>1</sup>, Kwang-Il Seon<sup>1</sup>, In-Soo Yuk<sup>1</sup>, Sun Choel Yang<sup>4</sup>, Jong-Oh Park<sup>5</sup>, Seung-Wu Rhee<sup>5</sup>, Hyung Mok Lee<sup>6</sup>, and Toshio Matsumoto<sup>6,7</sup>

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The MIRIS (Multi-purpose IR Imaging System), as the main payload of Science and Technology Satellite-3 (STSAT-3), is being developed by KASI in collaboration with several institutes for wide-field space observation in near IR wavelength. The Engineering Qualification Model (EQM) of MIRIS has been designed and fabricated in the laboratory. The system performance tests have been made including opto-mechanics, vibration test, thermal-vacuum environmental test and passive cooling test down to 200K. Most of the performance test results were satisfied with system requirements. The results of MIRIS performance tests have been presented at Critical Design Review (CDR) on September 2009. Several revisions were also recommended for Flight Model (FM) design, and detailed plan to develop FM of MIRIS is discussed in this paper.

**[(III-3-2] MIRIS 적외선우주관측카메라 광학계 인증모델 설계제작 및 시험**

이창희<sup>1</sup>, 박성준<sup>1,2</sup>, 문봉곤<sup>1</sup>, 차상목<sup>1</sup>, 이대희<sup>1</sup>, 정웅섭<sup>1</sup>, 박영식<sup>1</sup>, 남옥원<sup>1</sup>, 박장현<sup>1</sup>, 가능현<sup>1</sup>, 이미현<sup>1</sup>, 이덕행<sup>1,3</sup>, 양순철<sup>4</sup>, 김영주<sup>5</sup>, 이기훈<sup>5</sup>, 이승우<sup>6</sup>, T. Matsumoto<sup>7</sup>, 한원용<sup>1</sup>

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과학기술위성 3호의 주탑재체인 MIRIS (Multi-purpose InfraRed Imaging System) 적외선우주관측카메라의 인증모델이 조립을 마치고 현재 성능시험이 진행 중이다. MIRIS 적외선광학계는 구경 80mm의 광시야(f/2) 굴절식 망원경으로서, 총 5매의 렌즈로 구성되어 있다. 렌즈들은 S-FPL53, S-TIH6, Fused Silica 등의 재료를 사용해 가공되었으며, MIRIS 관측 파장대역(0.9~2.0 $\mu$ m)에서 투과율이 극대화되도록 반사억제 코팅이 적용되었다. MIRIS 광학계 및 광기계부 설계에 있어서의 주요 고려사항은, 1) 상온에서 조립된 상태에서 발사 시 위성체가 받는 충격과 진동을 견뎌낼 것, 그리고 2) 발사 후 위성 궤도상에서의 복사냉각