demonstrate that a solar eruption is caused by the imbalance between magnetic pressure gradient force and magnetic tension force. We conclude that this imbalance is produced by a weak but continuously existing solar wind above an active region.

[구 SS-09] Development of Full ice-cream cone model for HCME 3-D parameters

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The determination of three dimensional parameters (e.g., radial speed, angular width, source location) of Coronal Mass Ejections (CMEs) is very important for space weather forecast. To estimate these parameters, several cone models based on a flat cone or a shallow ice-cream cone with spherical front have been suggested. In this study, we investigate which cone model is proper for halo CME morphology using 26 CMEs which are identified as halo CMEs by one spacecraft (SOHO or STEREO-A or B) and as limb CMEs by the other ones. From geometrical parameters of these CMEs such as their front curvature, we find that near full ice-cream cone CMEs are dominant over shallow ice-cream cone CMEs. Thus we develop a new full ice-cream cone model by assuming that a full ice-cream cone consists of many flat cones with different heights and angular widths. This model is carried out by the following steps: (1) construct a cone for given height and angular width, (2) project the cone onto the sky plane, (3) select points comprising the outer boundary, (4) minimize the difference between the estimated projection speeds with the observed ones. We apply this model to 12 SOHO halo CMEs and compare the results with those from other stereoscopic methods (a geometrical triangulation method and a Graduated Cylindrical Shell model) based on multi-spacecraft data.

[구 SS-10] Comparison between quasi-linear theory and particle-in-cell simulation of solar wind instabilities

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The protons and helium ions in the solar wind are observed to possess anisotropic temperature profiles. The anisotropy appears to be limited by various marginal instability conditions. One of the efficient methods to investigate the global dynamics and distribution of various temperature anisotropies in the large-scale solar wind models may be that based upon the macroscopic quasi-linear approach. The present paper investigates the proton and helium ion anisotropy instabilities on the basis of comparison between the quasi-linear theory versus particle-in-cell simulation. It is found that the overall dynamical development of the particle temperatures is quite accurately reproduced by the macroscopic quasi-linear scheme. The wave energy development in time, however, shows somewhat less restrictive comparisons, indicating that while the quasi-linear method is acceptable for the particle dynamics, the wave analysis probably requires higher-order physics, such as wave-wave coupling or nonlinear wave-particle interaction. We carried out comparative studies of proton firehose instability, aperiodic ordinary mode instability, and helium ion anisotropy instability. It was found that the agreement between QL theory and PIC simulation is rather good. It means that the quasilinear approximation enjoys only a limited range of validity, especially for the wave dynamics and for the relatively high-beta regime.

태양계

[구 SS-11] Seasonal Variations of the Zodiacal Light toward the Ecliptic Poles at the Infrared Wavelengths

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The zodiacal light (ZL), combination of the sunlight scattered by and the infrared light emitted by the interplanetary dust (IPD) particles, changes with time due to the asymmetric distribution of the particles with respect to the Earth's orbit. Especially, the variation of the ZL brightness toward the ecliptic poles are useful to probe the

properties of the global distribution of the IPD because we can evade the effect of the small scale structures, such as the asteroidal dust bands. The ecliptic poles are frequently visited by the infrared (IR) space telescopes owing to their sun-synchronous orbits or for specific purposes. We collect and analyze the observations toward the ecliptic poles by COBE/DIRBE, AKARI, and MIRIS, covering the wavelengths from about 1 to 25 μm. The observed seasonal variations of the ZL are modeled with a simple IPD cloud model to derive cloud parameters. The parameters are compared with those of the empirical cloud models by Kelsall et al. (1998) and Kondo et al. (2016), and the discrepancies are discussed.

[구 SS-12] A Polarimetric Study of Long-Period Comet C/2013 US10 (Catalina) and Estimation of Its Gas Contamination in Optical and Near-Infrared Wavelengths

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Polarimetric study of light scattering from cometary dust particles can provide us opportunity to decipher their characteristics, such as sizes, structures, compositions of dust grains, etc. Herein, we present the results of our polarimetric study of long-period comet, C/2013 US10 (Catalina), in optical and near-infrared wavelengths which appeared at large phase angle (52.7 degrees) around the mid-December, 2015. We performed polarimetric and spectroscopic observations with HONIR, attached to the 1.5-m telescope at Higashi-Hiroshima Observatory, on UT 2015 December 17−18 and also obtained optical imaging data sets by the Ishigakijima Astronomical Observatory (IAO) and Okayama Astrophysical Observatory (OAO) taken between 2014−2015. By measuring the intensities of gas emission lines with respect to dust continuum and considering transmittance of each filter, we estimated that the percentages of gas contamination are approximately 10 percents in R_C-band and 3 percents in I_C-band. With these results, we derive the degree of linear polarization scattered solely from dust components in the coma. At this presentation, we will compare the phase-angle dependence of the degree of linear polarization with those of previous archive data in a wide coverage of wavelengths from R_C-band to K_S-band. Finally, we are supposed to discuss the spatial variations in polarization within the coma.

[구 SS-13] Dynamical evolution of dust particles: from comets to the inner solar system

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태양계의 행성간 공간에는 수많은 티끌들이 흩어져 있다. 이들의 존재는 유성, 우주 탐사선의 검출기, 황도광 관측 등으로 확인되고 있으나, 이 티끌들의 수명이 길어야 수백만년에 불과하기에 태양계에는 지속적으로 티끌을 공급하는 기원천체가 있어야 한다. 최근의 광학적 (Yang & Ishiguro, 2015), 역학적 연구는 ~90% 이상의 행성간 티끌들이 혜성에서 방출되었을 것이라 추정하기에 이르렀다. 이러한 상황에서, 본 연구에서는 행성간 티끌구름의 구체적 양상을 설명하려는 목적으로 혜성에서 방출된 티끌들이 태양계에서 겪게 되는 역학 진화를 수치 계산을 통하여 추적하였다.

우리는 다양한 혜성 궤도 분포를 골고루 대표할 수 있도록 실제 혜성 중에서 대표 혜성들을 선정하고, 관측에 기반한 티끌 방출 모형을 이용하여 다양한 크기의 가상적 티끌을 이들 혜성에서 방출시켰다. 태양의 복사에 의한 끌림힘, 8개의 행성에 의한 중력 섭동을 고려하며 이 티끌들의 궤도 진화가 추적되었다. 티끌들의 최종 종착지가 살펴졌고, 정상 상태를 가정하고 행성간 티끌구름을 구성하여 실제 관측되는 티끌구름과 비교하였다.

이번 발표에서는 혜성에 의한 티끌공급량과 내행성계의 티끌 유출입량, 내행성계 티끌구름의 크기도수분포, 티끌구름의 궤도 요소 분포, 황도광의 밝기 분포 등이 수치 계산 결과와 비교되어 설명될 것이다.

[구 SS-14] Measuring Homopause Temperatures of Jupiter, Saturn, and Titan via Three-micron Emission Spectra of CH_4

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Current high-resolution IR spectroscopy at ground-based observatories made it possible to observe 3-μm CH_4 emission lines from the atmospheres of Jupiter, Saturn, and Titan through narrow atmospheric windows avoiding the