

## Reflectance on Asteroid (25143) Itokawa from the Hayabusa Spacecraft Multi-band Imaging Camera(AMICA)

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Remote-sensing observation is one of the observation methods that provide valuable information, such as composition and surface physical conditions of solar system objects. The Hayabusa spacecraft succeeded in the first sample returning from a near-Earth asteroid, (25143) Itokawa. It has established a ground truth technique to connect between ordinary chondrite meteorites and S-type asteroids. One of the scientific observation instruments that Hayabusa carried, Asteroid Multi-band Imaging Camera(AMICA) has seven optical-near infrared filters (ul, b, v, w, x, p, and zs), taking more than 1400 images of Itokawa during the rendezvous phase.

The reflectance of planetary body can provide valuable information of the surface properties, such as the optical aspect of asteroid surface at near zero phase angle (i.e. Sun-asteroid-observer's angle is nearly zero), light scattering on the surface, and surface roughness. However, only little information of the phase angle dependences of the reflectance of the asteroid is known so far.

In this study, we investigated the phase angle dependences of Itokawa's surface to understand the surface properties in the solar phase angle of  $0^\circ - 40^\circ$  using AMICA images. About 700 images at the Hayabusa rendezvous phase were used for this study. In addition, we compared our result with those of several photometry models, Minnaert model, Lommel-Seeliger model, and Hapke model. At this conference, we focus on the AMICA's v-band data to compare with previous ground-based observation researches.

## [7 SS-05] Color Ratios of Parallel-Component Polarization as a Maturity Indicator for the Lunar Regolith

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Polarization of the light reflected off the Moon provides information on the size and composition of the particles in the lunar regolith. The mean

particle size of the regolith can be estimated from the combination of the albedo and degree of polarization, while the color ratio of the parallel-component polarization (CP) has been suggested to be related to the amount of nanophase metallic iron ( $npFe^0$ ) inside the regolith particles. Both the mean size and  $npFe^0$  abundance of the particles have been used as maturity indicators of the regolith since sustained impacts of high energy particles and micro-meteoroids cause comminution of particles and production of  $npFe^0$ . Based on our multispectral polarimetric observations of the whole near side of the Moon in the U, B, V, R, and I bands, we compare the maps of the mean particle size, CP, and the optical maturity (OM). We find that the mean particle size map is sensitive to the most immature ( $\sim 0.1$  Gyr) soil, the OP map to the intermediate immaturity (a few 0.1 Gyr) soil, and the CP map to the least immature ( $\sim 1$  Gyr) soil.

## [7 SS-06] Development of a Prototype System for the Optical-Video-Detection and Characterisation of Meteors/Fireballs in South Korea

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(Talk by Hinse, Jeong & Lee)

During a six-month period (autumn 2014 within the framework of a research & education project) we have constructed a professional double-station video-meteor detection network at the SOAO and BOAO mountain summits. Meteor detection is achieved by pixel-to-pixel motion-detection trigger. Each station is nearly autonomous and has three cameras with fixed viewing angles monitoring part of the night-sky over Korea. Various field of views are in use for testing purpose and captured video-meteor data is automatically transferred to a central FTP server on a nightly basis. Data is publicly available. The network has been operational since September 2014 and could serve as a prototype system for a more extended national network for meteor/fireball monitoring and detection in Korean airspace. We will report on the network construction, technical setup and present first results of detected meteors and fireballs. Further information: [Meteors@KASI](mailto:Meteors@KASI):

<http://meteor.kasi.re.kr>.

## 태양 / 우주과학

### [구 SS-07] Determination of coronal electron density distributions by DH type II radio bursts and CME observations

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In this study, we determine coronal electron density distributions by analyzing DH type II radio observations based on the assumption: a DH type II radio burst is generated by the shock formed at a CME leading edge. For this, we consider 11 Wind/WAVES DH type II radio bursts (from 2000 to 2003 and from 2010 to 2012) associated with SOHO/LASCO limb CMEs using the following criteria: (1) the fundamental and second harmonic emission lanes are well identified; (2) its associated CME is clearly identified in the LASCO-C2 or C3 field of view at the time of type II observation. For these events, we determine the lowest frequencies of their fundamental emission lanes and the heights of their leading edges. Coronal electron density distributions are obtained by minimizing the root mean square error between the observed heights of CME leading edges and the heights of DH type II radio bursts from assumed electron density distributions. We find that the estimated coronal electron density distribution ranges from 2.5 to 10.2-fold Saito's coronal electron density models.

### [구 SS-08] Three-dimensional evolution of a solar magnetic field that emerges, organizes and produces a flare and flare-associated eruptions of a flux rope and plasmoid

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Solar flare is one of the energetic phenomena observed on the Sun, and it is often accompanied with eruptions such as global-scale eruption of a

flux rope (filament/prominence eruption) and small-scale eruption of a plasmoid. A flare itself is a dissipative phenomenon where accumulated electric current representing free magnetic energy is dissipated quickly at a special location called a current sheet formed in a generally highly conductive solar corona. Previous studies have demonstrated how a solar magnetic field placed on the Sun forms a current sheet when magnetic shear is added to the field. Our study is focused on a self-consistent process of how a subsurface magnetic field emerges into the solar atmosphere and forms a current sheet in the corona. This study also gives light to a relation among a flare and two types of flare-associated eruptions; flux-rope eruption and plasmoid eruption.

### [구 SS-09] Characteristics of Four SPE Classes According to Onset Timing and Proton Acceleration Patterns

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In our previous work (Kim et al., 2015), we suggested a new classification scheme, which categorizes the SPEs into four groups based on association with flare or CME inferred from onset timings as well as proton acceleration patterns using multienergy observations. In this study, we have tried to find whether there are any typical characteristics of associated events and acceleration sites in each group using 42 SPEs from 1997 to 2012. We find: (i) if the proton acceleration starts from a lower energy, a SPE has a higher chance to be a strong event (>5000pfu) even if the associated flare and CME are not so strong. The only difference between the SPEs associated with flare and CME is the location of the acceleration site. For the former, the sites are very low (~1Rs) and close to the western limb, while the latter has a relatively higher and wider acceleration sites. (ii) When the proton acceleration starts from the higher energy, a SPE tends to be a relatively weak event (<1000pfu), in spite of its associated CME is relatively stronger than previous group. (iii) The SPEs categorized by the simultaneous proton acceleration in whole energy range within 10 minutes, tend to show the weakest proton flux in spite of strong related eruptions. Their acceleration heights are very close to the locations of type II radio bursts. Based on those results, we suggest that the different characteristics of the four groups are mainly due