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| **Session:** | **[B2C-1] S1 : Solar System and Sun-Earth Interactions** |
| **Date:** | August 19, 2014 (Tuesday) |
| **Time:** | 16:00~17:30 |
| **Room:** | Room A (Room 101~102) |
| **Chair:** | Saku Tsuneta (Japan Aerospace Exploration Agency) |

**[B2C-1-1]** **16:00~16:15**

### Which Cone Type is Closer to 3-D CME Structures?

Hyeonock Na (Kyung Hee University, Korea), Yong-Jae Moon, Harim Lee, Soojeong Jang, and Jae-Ok Lee

Recently, CME cone models are widely used for inferring three dimensional structures of CMEs and their propagation through the heliosphere, especially for the input parameters of CME propagation models. However, there has been no observational test which cone type is closer to CME 3-D structures. In this study, we investigate which cone model is proper for halo CME morphology using 35 CMEs which are identified as halo CMEs by one spacecraft and as limb CMEs by the other ones. These CMEs were taken by SOHO/LASCO and STEREO/SECCHI during the period from 2010 December to 2011 June when two spacecraft were separated by 90° ± 10°, which allows us to directly estimate their angular widths from observations. From geometrical parameters of these CMEs such as their front curvature, they are classified into two groups: shallow cone CME whose curvature radius is equal to the distance of CME front from the center of the Sun, and full-cone CME, whose front has a semi-circle shape. Our results show that most of the events are closer to the full cone type than the shallow cone type.

**[B2C-1-2]** **16:15~16:30**

### Magnetohydrodynamic Modeling of the Solar Flare Based on the Photospheric Magnetic Field

Satoshi Inoue (Kyung Hee University, Korea), Keiji Hayashi, and Gwangson Choe

Solar flares and coronal mass ejections (CMEs) are biggest explosions in our solar system and primarily driver sources causing the large space storm in our geospace. Therefore, the understanding of these fundamental processes is important extremely to build up the space weather forecast. These are widely considered as sudden liberation of magnetic energy in the solar corona; nevertheless, we could not reach on a common understanding yet. In order to clarify them, in this study we perform a magnetohydrodynamic (MHD) simulation combined with photospheric magnetic field before X2.2-class flare taking place in the solar active region 11158, observed by Solar Dynamics Observatory (SDO). We first extrapolate a three-dimensional (3D) coronal magnetic field under the Nonlinear Force-Free Field (NLFFF) approximation based on the photospheric magnetic field to understand its 3D and physical properties. Next we perform a MHD simulation using the NLFFF prior to the flare to clarify the dynamics during the flare.
As a result, we found that the NLFFF has strongly twisted field lines; most of them are in the range from half-turn to one turn twist, being resided above the polarity inversion line. Because the most of these strongly twisted lines disappear after the flare, consequently the twisted field lines having more than half-turn twist play an important role on causing the large flare. On the other hand, we found that the NLFFF never shows the dramatic dynamics seen in observations, i.e., it is in stable state against the perturbations. However, the MHD simulation shows that when the strongly twisted lines are formed close to the neutral line, which are produced via tether-cut reconnection in the twisted lines of the NLFFF, consequently they erupt away from the solar surface via the complicated reconnection. In addition to this the dynamical evolution of these field lines reveals that at the initial stage the spatial pattern of the footpoints caused by the reconnection of the twisted lines appropriately maps the distribution of the observed two-ribbon flares. Interestingly, after the flare the reconnected field lines convert into the structure like the post flare loops, which is analogous to EUV image taken by SDO. Eventually, we found that the twisted lines exceed a critical height at which the flux tube becomes unstable to the torus instability. These results illustrate the reliability of our simulation and also provide an important relationship between flare-CME dynamics. We will also discuss that how much twists

are needed to lunch from the solar surface, and the reconnection dynamics while the twisted lines are ascending.

**[B2C-1-3]** **16:30~16:45**

### Flux Rope Eruption above Kinked Filament Observed by SDO/AIA and STEREO

Pankaj Kumar (Korea Astronomy and Space Science, Korea) and K.S. Cho

We present multiwavelength observations of a C-class limb flare associated with the eruption of a flux rope. The high resolution images recorded by SDO/AIA 304, 1600 Å and Hinode/SOT Hα show the activation of a mini-filament associated with kink instability and the onset of a C-class flare near the southern leg of the filament. The filament showed unwinding motion of the northern leg and apex in the counterclockwise direction and failed to erupt. A twisted flux-rope was appeared during magnetic reconnection taking place above the kinked filament. The flux rope rises slowly (～100 km/s ) producing a rather big twisted structure possibly by reconnection with the surrounding sheared magnetic fields within ～15-20 minutes, and showed an impulsive acceleration reaching a height of about 80–100 Mm. This study focuses on the formation and eruption of the flux rope structure observed in the hot AIA channels.

**[B2C-1-4]** **16:45~17:00**

### Wave Properties of a Pore Observed by SDO HMI and AIA on 2013 March 11

Su-Chan Bong (Korea Astronomy and Space Science Institute, Korea), Kyung-Suk Cho, Eun-Kyung Lim, Il-Hyun Cho, Yeon-Han Kim, and Young-Deuk Park

We report the wave properties of a pore observed by HMI (Helioseismic and Magnetic Imager) and AIA (Atmospheric Imaging Assembly) onboard SDO (Solar Dynamics Observatory) on 2013 March 11. The pore is about 5 arcsec in diameter and well isolated from the other pores or spots. We calculated the weighted mean values of intensity, line-of-sight magnetic field, and line-of-sight velocity inside the pore as well as the area. We found strong 4.5 min oscillation in the photospheric HMI intensity but could not find prominently enhanced power at the corresponding period in the magnetic field, velocity, and area. In AIA, we could see strong oscillation at 5.5 min period in the low chromospheric 160 nm and 170 nm intensity, and at 2.5 min period in the upper chromospheric 30.4 nm intensity. This is in contrast with the conventional cut-off frequency explanation that interior waves with frequencies higher than the cut-off frequency propagate through the upper atmosphere.

**[B2C-1-5]** **17:00~17:15**

### Correlated Multipath Effects between Distant Radio Telescopes

P. N. Diep (Vietnam Astrophysics Training Laboratory, Vietnam), N. T. Phuong, P. Darriulat, P. T. Nhung, P. T. Anh, P. N. Dong, D. T. Hoai, and N. T. Thao

A multipath mechanism similar to that used in Australia sixty years ago by the Sea-cliff Interferometer is shown to generate correlations between the periods of oscillations observed by two distant radio telescopes pointed to the Sun. The oscillations are the result of interferences between the direct wave detected in the main antenna lobe and its reflection on ground detected in a side lobe. A model is made of such oscillations in the case of two observatories located at equal longitudes and opposite tropical latitudes, respectively in Ha Noi (Viet Nam) and Learmonth (Australia), where similar radio telescopes are operated at 1.4 GHz. Simple specular reflection from ground is found to give a good description of the observed oscillations and to explain correlations that had been previously observed and for which no satisfactory interpretation, instrumental or other, had been found.

**[B2C-1-6]** **17:15~17:30**

### Relationship between Metric Type II Solar Radio Bursts and Coronal Mass Ejections

Kyungsuk Cho (Korea Astronomy and Space Science Institute, Korea)

Metric type II solar radio bursts are known radio signatures of coronal shocks. Since the first discovery of the

metric type II burst by Payne-Scott, Yabsley, and Bolton (1947), the debate on the origin (solar flare and/or coronal mass ejection) of the type II bursts has continued. By comparing kinematics of m-type II shocks with those of CMEs observed by SOHO/LASCO C1 & C2, MLSO/MK4, STEREO/COR1, and SDO/AIA, I have investigated the relationship between the type II shocks and CMEs. I found that CMEs could be main source of type II bursts, and suggested that type II bursts are generated in two sites: either at the CME nose or at the CME-streamer interaction site. I will review my studies on the relationship between CMEs and metric type II radio bursts.