Session:	**[B2A-1] S1 : Solar System and Sun-Earth Interactions**
Date:	August 19, 2014 (Tuesday)
Time:	11:00~12:20
Room:	Room A (Room 101~102)
Chair:	Jongchul Chae (Seoul National University)

[B2A-1-1] **11:00~11:20**

[Invited] Solar Super-Active Regions and Major Activity Events

Jingxiu Wang (National Astronomical Observatories, Chinese Academy of Sciences, China) and Anqin Chen

Each solar activity cycle is characterized by a few super-active regions. They occupied less than 0.5% of total active regions, but produced over 40% of X class X-ray solar flares. Super-active regions resulted in a clear (> 0.1%) depress of total solar irradiance during their central meridian transients. In this sense, they are star-spots seen by remote observers. In this presentation, we first discuss the general statistical properties of super-active regions based on the previous studies of solar cycles 19 to 23; then we focus on the characteristics of vector magnetic fields of super-active regions by using the vector magnetograms obtained at Huairou Solar Observing Station in the last two solar cycles; Finally, we describe in details the super-active regions and major activity events in Solar Cycle 24. So far in Solar Cycle 24, only two active regions meet with the parameterized conditions of super-active regions that established from a detailed statistics for the cycles 21-23. The implications of this unusual fact are discussed.

[B2A-1-2] **11:20~11:35**

Development of Daily Solar Flare and CME Probability Models Depending on Sunspot Class and Its Area Change

Kangjin Lee (Kyung Hee University, Korea), Yong-Jae Moon, and Jin-Yi Lee

We investigate the solar flare and CME occurrence probability depending on sunspot class and its area change. For this we use the Solar Region Summary (SRS) from NOAA, NGDC flare catalog, and SOHO/LASCO CME catalog for 16 years (from January 1996 to December 2011). We classify each sunspot class into two sub-groups: “Large” and “Small”. For each class, we classify it into three sub-groups according to sunspot area change: “Decrease”, “Steady”, and “Increase”. In terms of sunspot area, the solar flare and CME occurrence probabilities noticeably increase at large and compact sunspot groups (e.g., ‘Fkc’). In terms of sunspot area change, solar flare and CME probabilities for the “Increase” sub-groups are noticeably higher than those for the other sub-groups. Our results demonstrate statistically that magnetic flux and its emergence enhance solar flare and CME occurrence, especially for compact and large sunspot groups. In case of solar flare, we have developed a daily probability forecast model .Then we apply an evaluation method of NOAA/SWPC to our model. As a result, we find that mean absolute error and mean square error are lower than those of NOAA’s flare forecast model. We also find that linear association and skill score are better than NOAA’s values. Our forecast model will be used for space weather operation at KMA.

[B2A-1-3] **11:35~11:50**

Lower Temperature Response of an EUV Wave Observed by Hinode/EIS and SDO/AIA

Kyoung-Sun Lee (ISAS/JAXA, Japan), Ryun-Young Kwon, David Brooks, and Toshifumi Shimizu

We investigate an EUV wave observed by Hinode/EIS and SDO/AIA on 2011 August 04. The EUV wave propagates across the solar disk and the wave front passing through a remote active region (AR 11263) is observed by EIS. This EUV wave has already been analyzed using coronal lines, but the lower temperature response to the EUV wave has not been investigated. Using multi-wavelength observations from EIS and

AIA, we determined the intensity and Doppler velocity variation of different temperature lines and compared them. From the comparison, we found an enhancement of the intensity at lower temperatures before the intensity increase seen in the coronal filters of AIA. And a significant enhancement of the red shift (~10 km/s) in the lower temperature line (Si VII, log T ~ 5.8) compared to the increase of the red shift (~3 km/s) in coronal lines (Fe XII, Fe XIII, and Si X, log T ~ 6.1-6.2) when the EUV wave interacts with the active region. We will discuss the impact of the EUV wave on the lower temperature emission.

[B2A-1-4] **11:50~12:05**

A Trio of Flares Observed in AR 11087

Anand D. Joshi (Korea Astronomy and Space Science Institute, Korea) and Terry G. Forbes

We investigate three flares that occurred in active region, AR 11087, observed by the Dutch Open Telescope (DOT) on 13 Jul 2010 from 07:30 to 11:55 UT. The AR, located roughly at 27° N, -26° E, has a small U-shaped filament in the southern penumbral region of the sunspot, and a quiescent filament is lying to its west. The first two flares, peaking at 08:35 UT and 10:13 UT, had GOES soft X-ray class B3, whereas the third flare had class C3 and it peaked at 10:51 UT. The third flare was not only the largest in terms of area and brightness, but it also showed a very faint CME associated with it, while the earlier two flares had no associated CME. The DOT observed AR 11087 at seven line positions across the Hα line. Line-of-sight velocity is determined from the DOT observations to observe chromospheric dynamics of the AR and the two filaments. In addition, we use observations from the Solar Dynamics Observatory (SDO) to study the AR. Magnetograms from Helioseismic and Magnetic Imager (HMI) are used to observe the changes in magnetic flux in the AR, while extreme ultraviolet images from the Atmospheric Imaging Assembly (AIA) are used to study dynamics in the AR at higher temperatures. In particular we would be addressing the question as to why only the third flare had a CME associated with it. In this regard, the role played by the quiescent filament would be probed. It will be shown that although there is no visible connection between the AR filament and the quiescent filament, the filament channel still mediates events occurring at the two places.

[B2A-1-5] **12:05~12:20**

How Well Can We Estimate the Magnetic Helicity Influx during a Magnetic Flux Emergence with a Footpoint Tracking Method?

G. S. Choe (Kyung Hee University, Korea), and Sunjung Kim

As shown by Démoulin and Berger (2003), the magnetic helicity flux through the solar surface into the solar atmosphere can be exactly calculated if we can trace the motion of footpoints with infinite temporal and spatial resolutions. When there is a magnetic flux transport across the solar surface, the horizontal velocity of footpoints becomes infinite at the polarity inversion line, but the surface integral yielding the helicity flux does not diverge. In practical application, a finite temporal and spatial resolution causes an underestimate of the magnetic helicity flux when a magnetic flux emerges from below the surface. In this paper, we consider emergence of simple two- and half-dimensional magnetic flux ropes and calculate the supremum of the magnitude of the helicity influx that can be estimated from footpoint tracking, per unit length in the invariant direction. The results depend on the ratio of the resolvable length scale and the flux rope diameter. For a Gold-Hoyle flux rope, in which all field lines are uniformly twisted, the observationally estimated helicity influx would be about 90% of the real influx when the ratio is 0.01 and about 45% when the ratio is 0.1. For Lundquist flux ropes, the errors to be incurred by observational estimation would be smaller than the case of the Gold-Hoyle flux rope, but could be as large as 30%. Our calculation suggests that the error in the helicity influx estimate is at least half of the real value or even larger when small scale magnetic structures emerge into the solar atmosphere.