Chromosphere and Transition Region to a Coronal Rain Event

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We report that a strong downflow event caused three-minute oscillations in the solar atmosphere. Our observations were carried out by using the Fast Imaging Solar Spectrograph (FISS) of the 1.6 meter New Solar Telescope (NST) and the Interface Region Imaging Spectrograph (IRIS). Our main findings are as follows: (1) The strong downflow was seen at the Hα absorption line at first, and then appeared at the Si IV and C II emission lines. It seems that the characteristics of the downflow are consistent with a coronal rain event. (2) After the event, oscillations of velocity were identified in the chromospheric lines and transition region lines. (3) The amplitudes of oscillations were 2km/s at Mg II line and 3km/s at C II and Si IV lines and decreased with time. (4) The period of the oscillation was 2.67 minutes at first, but gradually increased with time. Our findings are in agreement with Chae & Goode (2015) 's theory that of acoustic waves generated by a disturbance in a gravitationally-stratified medium.

[포 SS-03] Photometric observations of the Baptistina asteroid family

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The Baptistina family is one of the typical young asteroid families with an age estimated to be about 140-320 Myrs old (Masiero et al. 2012); considered to have not enough time to experience a significant collisional and dynamical evolution since it was formed. Therefore, it may offer a unique insight into spin rate distribution of relatively fresh fragments and physical mechanism of a family break-up event.

Observations of the Baptistina family asteroids were conducted during 111 nights from 2013 Oct. to 2015 Feb., using 0.5 m- to 2 m- class telescopes at 6 observatories in the northern hemisphere. We used CCD cameras on the Sobaeksan Optical Astronomy Observatory (SOAO) 0.6 m telescope on Mt. Sobaek, Korea, the Lemmonsan Optical Astronomy Observatory (LOAO) 1.0 m telescope on Mt. Lemmon, USA, the Tubitak Ulusal Gozlemevi (TUG) 1.0 m telescope in Bakirlitepe, Turkey, the Bohyunsan Optical Astronomy Observatory (BOAO) 1.8 m telescope on Mt. Bohyun, Korea, the McDonald Observatory 2.1 m Otto Struve Telescope on Mt. Locke, USA, and the National Astronomical Research Institute of Thailand (NARIT) Observatory 2.4 m telescope on Mt. Doi Inthanon, Thailand. Here, we will present our preliminary results for lightcurve analyses of Baptistina family members.

[포 SS-04] Evaluation of a Solar Flare Forecast Model with Cost/Loss Ratio

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There are probabilistic forecast models for solar flare occurrence, which can be evaluated by various skill scores (e.g. accuracy, critical success index, heidek skill score, true skill score). Since these skill scores assume that two types of forecast errors (i.e. false alarm and miss) are equal or constant, which does not take into account different situations of users, they may be unrealistic. In this study, we make an evaluation of a probabilistic flare forecast model (Lee et al. 2012) which use sunspot groups and its area changes as a proxy of flux emergence. We calculate daily solar flare probabilities from 1996 to 2014 using this model. Overall frequencies are 61.08% (C), 22.83% (M), and 5.44% (X). The maximum probabilities computed by the model are 99.9% (C), 89.39% (M), and 25.45% (X), respectively. The skill scores are computed through contingency tables as a function of forecast probability, which corresponds to the maximum skill score depending on flare class and type of a skill score. For the critical success index widely used, the probability threshold values for contingency tables are 25% (C), 20% (M), and 4% (X). We use a value score with cost/loss ratio, relative importance between the two types of forecast errors. We find that the forecast model has an effective range of cost/loss ratio for each class flare: 0.15-0.83(C), 0.11-0.51(M), and 0.04-0.17(X), also depending on a lifetime of satellite. We expect that this study would provide a guideline to determine the probability threshold for space weather forecast.

[포 SS-05] Heating of a coronal loop

by the evolution of the fine-scale magnetic discontinuity in the photosphere

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We report a small-scale EUV bright loop associated with the evolution of the fine-scale magnetic discontinuity in the photosphere. Our analysis was carried out by using the high spatial resolution data taken with InfraRed Imaging Magnetograph (IRIM) and the Fast Imaging Solar Spectrograph (FISS). As a result, an extremely narrow dark lane of the intense horizontal magnetic field (width ~ 300 km) is detected parallel to the boundary of the magnetic pore, which is one of the footpoints of the small-scale bright coronal loop. We find that the variation of the net linear polarization inside the dark lane is closely related to the intensity variations of the coronal loop. Based on our results, we suggest that small-scale atmospheric heating such as bright coronal loop seen above the complex pore group may be strongly affected by the evolution of the fine-scale magnetic discontinuity in the photosphere. This is a nice example of solar atmospheric heatings associated with the fine-scale magnetic discontinuity in the photosphere.

[포 SS-06] Mass and energy of erupting plasma associated with a coronal mass ejection in X-rays and EUV

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We investigate the mass and energy of erupting plasma observed in X-rays and EUV, which is associated with a coronal mass ejection (CME) and an X-class flare. The erupting plasma was observed by both the X-ray telescope (XRT) on Hinode and the Atmospheric Imaging Assembly (AIA) on Solar Dynamic Observatory (SDO). We estimate the emission measures of the erupting plasma using a differential emission measure method. The plasma erupts with a loop-like structure in X-ray and EUV. We estimate the mass of erupting plasma assuming a cylinder structure. In addition, we estimate the radiative loss, thermal conduction, thermal, and kinetic energies of the eruptive hot plasma. We find that the thermal conduction timescale is much shorter than the duration of the eruption. This result implies that additional heating during the eruption may be required to explain the hot plasma observations in X-rays.

[포 SS-07] Spin and shape analysis for the Mars-crossing asteroid 2078 Nanking

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The YORP effect is non-gravitational force that changes the spin-status of asteroid. So far this effect has been directly detected only from the Near-Earth asteroids (Taylor et al. 2007; Lowry et al. 2007, 2014; Breiter et al. 2011; Durech et al. 2008, 2012). Pravec at el. 2008 found the evidences for changing spin rate of small asteroids (3 - 15 km) by the YORP effect in the Main-Belt and Mars-crossing asteroids. The Mars-crossing asteroids ($1.3 < q < 1.66$ AU) are objects that cross orbit of the Mars. The Mars-crossing asteroids are regarded as one of the main sources for the Near-Earth asteroids. We expect that rotation of Mars-crossing asteroids would be influenced by the YORP effect. We try to search observational evidence of the YORP effect for the Mars-crossing asteroid. Our target 2078 Nanking is a population of the Mars-crossing asteroid. First light-curve of 2078 Nanking was obtained from Mohamed et al. 1994, and Warner et al. 2015 recently published new observational data. We observed this asteroid on 26th Nov. 2014 and 17th Jan. 2015 using SOAO (Sobaeksan Optical Astronomy Observatory) 0.61 m telescope with 4K CCD. Using light-curve inversion method (Kaasalainen & Torppa 2001; Kaasalainen et al. 2001), we try to determine the pole orientation and shape model of this asteroid based on the combination of our light-curve and literature photometric data. Knowing spin parameters, such as rotational period and spin axis, are essential for studying the YORP effect. In this presentation, we provide some preliminary results of our recent study: light-curve and processing of shape modeling of 2078 Nanking. We