A stationary Type IV (IVs) radio burst was observed on September 24, 2011. Observations from the Nançay RadioHeliograph (NRH) show that the brightness temperature (TB) of this burst is extremely high, over 10^11K at 150 MHz and over 10^8K in general. The degree of circular polarization (q) is between −60%∼−100% , which means that it is highly left-handed circularly polarized. The flux-frequency spectrum follows a power-law distribution, and the spectral index is considered to be roughly −3∼−4 throughout the IVs. Radio sources of this event are located in the wake of the coronal mass ejection and are spatially dispersed. They line up to present a formation in which lower-frequency sources are higher. Based on these observations, it is suggested that the IVs was generated through electron cyclotron maser emission.

[구 SS-05] Investigation of the observed solar coronal plasma in EUV and X-rays in non-equilibrium ionization state

Jin-Yi Lee[1], John C. Raymond[2], Katharine K. Reeves[2], Chengcai Shen[2], and Yong-Jae Moon[1]
[1]*Kyung Hee University*
[2]*Harvard-Smithsonian Center for Astrophysics*

During a major solar eruption, the erupting plasma is possibly out of the equilibrium ionization state because of its rapid heating or cooling. The non-equilibrium ionization process is important in a rapidly evolving system where the thermodynamical time scale is shorter than the ionization or recombination time scales. We investigate the effects of non-equilibrium ionization on EUV and X-ray observations by the Atmospheric Imaging Assembly (AIA) on board Solar Dynamic Observatory and X-ray Telescope (XRT) on board Hinode. For the investigation, first, we find the emissivities for all the lines of ions of elements using CHIANTI 8.07, and then we find the temperature responses multiplying the emissivities by the effective area for each AIA and XRT passband. Second, we obtain the ion fractions using a time-dependent ionization model (Shen et al. 2015), which uses an eigenvalue method, for all the lines of ion, as a function of temperature, and a characteristic time scale, $n_e t$, where n_e and t are density and time, respectively. Lastly, the ion fractions are multiplied to the temperature response for each passband, which results in a 2D grid for each combination of temperature and the characteristic time scale. This is the set of passband responses for plasma that is rapidly ionized in a current sheet or a shock. We investigate an observed event which has a relatively large uncertainty in an analysis using a differential emission measure method assuming equilibrium ionization state. We verify whether the observed coronal plasmas are in non-equilibrium or equilibrium ionization state using the passband responses.

[구 SS-06] Determination of magneto-hydrodynamic quantities in umbrae and bright points using MHD seismology

Il-Hyun Cho, Yong-Jae Moon
Kyung Hee University

We perform seismological diagnostics of the physical parameters in umbral photospheres and G-band bright points. The technique is based on the theory of slow magneto-acoustic waves in a non-isothermally stratified photosphere with uniform vertical magnetic fields. For the seismology of sunspot umbrae, we calculate the weighted frequency of three-minute oscillations observed by SDO/HMI continuum and use it to estimate the Alfvn speed and plasma-beta, which range 7.5–10.5 km/s and 0.65–1.15, respectively. We identify and track bright points in the G-band movie by using a 3D region growing method. Then we apply the seismological diagnostics to the bright points in the Hinode/BFI Blue continuum. We will present the Alfvn speed and plasma-beta in the bright points.

태양 CME

[구 SS-07] CME propagation and proton acceleration in solar corona

Roksoon Kim[1,2], Ryunyoung Kwon[3,4], Jaeok Lee[1], David Lario[3]
[1]*Korea Astronomy and Space Science Institute,* [2]*University of Science and Technology,* [3]*Johns Hopkins University, Applied Physics Laboratory,* [4]*George Mason University*

Solar Proton Events (SPEs) are the energetic phenomena related particle acceleration occurred in solar corona. Conventionally, they have been classified into two groups as the impulsive and gradual cases caused by reconnection in the flaring site and by shock generated by CME, respectively. In the previous studies, we classified these into four groups by analyzing the proton acceleration patterns in multi-energy channel observation. This showed that acceleration due to the magnetic reconnection may occur in the