[포SS-11] Radio and Hard X-ray Study of the 2011 August 09 Flare

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The 2011 August 09 Flare is one of the largest X-ray flares of Sunspot Cycle 24 to attract a lot of attention for its various activities detected in coronal images. In this study we concern ourselves mostly on information of high energy electrons produced during this flare provided by hard X ray data from the Reuven Ramaty High-Energy Solar Spectroscopic Imager (RHESSI) and radio data from the Korean Solar Radio Burst Locator (KSRBL) and Ondrejov. EUV images obtained by the Atmospheric Imaging Assembly (AIA) on board the Solar Dynamic Observatory are used to provide the context of magnetic reconnection. In our results, (1) HXR spectra have a rich spectral morphology. Initially it could be fit by one thermal component (T~30MK) and one single power law nonthermal spectrum, but later a better fit could be made by introducing an additional thermal component (T~55 MK). (2) Time delays between the KSRBL burst and the RHESSI hard X-ray emission were found which are more obvious at low frequencies and insignificant at high frequencies. (3) The HXR source lies in the core of the quadrupolar active region. In our interpretation based on AIA 94 A images, the outer part of the active region erupted to be blown out, leaving the intense hard X-ray emission concentrated in the core. We relate the appearance of the second thermal component to the evolution of the AIA 171 and 94 A images. The time delays of microwave peaks to HXR peaks are interpreted as indicating presence of trapped electrons in larger closed magnetic loops. With these result we conclude that the hard X ray and microwaves are due to impulsive acceleration in the low and high heights and a sigmoidal reconnection scenario.

[포SS-12] Chromospheric Canopy Fields over a Flux Emergence Region as a Key Condition for Formation of the Sunspot Penumbra

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A presence of a penumbra is one of the main properties of a mature sunspot, and its formation mechanism has been elusive due to a lack of observations that fully cover the formation process. Utilizing the New Solar Telescope at the Big Bear Solar Observatory, we observed the formation of a partial penumbra for about 7 hours simultaneously at the photospheric (TiO; 7057Å) and the chromospheric (Hα, -1Å) spectral lines with high spatial and temporal resolution. From this uninterrupted, long observational sequence, we found that flux emergence under the stable chromospheric canopy fields resulted in penumbra formation, while emerging flux under the expanding chromospheric fields appeared as transient elongated granules. Based on these findings, we suggest a possible scenario for penumbra formation in which a penumbra forms when the emerging flux is constrained from continuing to emerge, but rather is trapped at the photospheric level by the overlying chromospheric canopy fields.