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태양 / 우주과학

[구 SS-07] Determination of coronal electron density distributions by DH type II radio bursts and CME observations

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In this study, we determine coronal electron density distributions by analyzing DH type II radio observations based on the assumption: a DH type II radio burst is generated by the shock formed at a CME leading edge. For this, we consider 11 Wind/WAVES DH type II radio bursts (from 2000 to 2003 and from 2010 to 2012) associated with SOHO/LASCO limb CMEs using the following criteria: (1) the fundamental and second harmonic emission lanes are well identified; (2) its associated CME is clearly identified in the LASCO-C2 or C3 field of view at the time of type II observation. For these events, we determine the lowest frequencies of their fundamental emission lanes and the heights of their leading edges. Coronal electron density distributions are obtained by minimizing the root mean square error between the observed heights of CME leading edges and the heights of DH type II radio bursts from assumed electron density distributions. We find that the estimated coronal electron density distribution ranges from 2.5 to 10.2-fold Saito's coronal electron density models.

[구 SS-08] Three-dimensional evolution of a solar magnetic field that emerges, organizes and produces a flare and flare-associated eruptions of a flux rope and plasmoid

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Solar flare is one of the energetic phenomena observed on the Sun, and it is often accompanied with eruptions such as global-scale eruption of a flux rope (filament/prominence eruption) and small-scale eruption of a plasmoid. A flare itself is a dissipative phenomenon where accumulated electric current representing free magnetic energy is dissipated quickly at a special location called a current sheet formed in a generally highly conductive solar corona. Previous studies have demonstrated how a solar magnetic field placed on the Sun forms a current sheet when magnetic shear is added to the field. Our study is focused on a self-consistent process of how a subsurface magnetic field emerges into the solar atmosphere and forms a current sheet in the corona. This study also gives light to a relation among a flare and two types of flare-associated eruptions; flux-rope eruption and plasmoid eruption.

[구 SS-09] Characteristics of Four SPE Classes According to Onset Timing and Proton Acceleration Patterns

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In our previous work (Kim et al., 2015), we suggested a new classification scheme, which categorizes the SPEs into four groups based on association with flare or CME inferred from onset timings as well as proton acceleration patterns using multienergy observations. In this study, we have tried to find whether there are any typical characteristics of associated events and acceleration sites in each group using 42 SPEs from 1997 to 2012. We find: (i) if the proton acceleration starts from a lower energy, a SPE has a higher chance to be a strong event (>5000pfu) even if the associated flare and CME are not so strong. The only difference between the SPEs associated with flare and CME is the location of the acceleration site. For the former, the sites are very low (~1Rs) and close to the western limb, while the latter has a relatively higher and wider acceleration sites. (ii) When the proton acceleration starts from the higher energy, a SPE tends to be a relatively weak event (<1000pfu), in spite of its associated CME is relatively stronger than previous group. (iii) The SPEs categorized by the simultaneous proton acceleration in whole energy range within 10 minutes, tend to show the weakest proton flux in spite of strong related eruptions. Their acceleration heights are very close to the locations of type II radio bursts. Based on those results, we suggest that the different characteristics of the four groups are mainly due