

hence evolution of cluster galaxies. We also discuss the origin of extraplanar ^{13}CO , and how ram pressure can potentially contribute to the chemical evolution of the ICM.

[구 GC-13] Identifying Cosmic Voids using Clusters as the Antipode

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We report progress on identifying cosmic voids using cluster halos as the antipode. According to the standard scenario of structure formation, clusters are expected to form at peaks of the initial density field, whereas cosmic voids form at troughs. Then, a cluster would be a void if the sign of the initial density fluctuation of the universe were inverted. To study the relevance of anti-structures of clusters to cosmic voids, we use a pair of simulations whose initial density fields are sign inverted versions to each other. By examining the spatial distribution and environment of the particles in inverted simulation, which are the member particles of clusters in the other simulation, we discuss the characteristics of the antipode structures of clusters including their size, density, internal structure, and redshift evolution as well.

[석 GC-14] ALT(Lambda-Lemaître-Tolman) solution for the Hubble Tension

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허블 텐션이란 허블우주망원경으로 관측한 허블상수 값과 플랑크 위성으로 측정한 허블상수 값이 일치하지 않는 문제를 일컬으며 현재 우주론에서 주목 받는 이슈 중 하나이다. 밀도가 작은 지역에선 약한 중력으로 공간의 팽창이 빠르고, 반대로 밀도가 큰 지역에서는 팽창이 느리다. 만약, 우리 근처에서 상대적으로 낮은 밀도 때문에 팽창 속도의 차이가 생긴다면 허블 텐션의 원인을 쉽게 설명할 수 있다. 이 문제를 구체적으로 다루기 위해, 우리는 우주 상수를 고려한 아인슈타인 중력의 구형 우주론 풀이인 Lambda-Lemaître-Tolman (ALT) 모형을 사용하였다. 우리로부터 먼 현상은 기존의 Λ CDM(Λ cold dark matter) 모형으로, 가까운 현상은 국소적인 LT 모형으로 기술함으로써 허블 텐션 문제를 해결하고자 하였다. 또한, 마코프 체인 몬테 칼로 (MCMC) 방법을 적용하여 천문 관측 결과를 잘 맞추는 ALT 모형의 변수들을 탐색하였다.

태양/태양계

[구 SS-01] A Comprehensive View of Three-minute Umbral Oscillations

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Our recent observations of the Sun through strong spectral lines have revealed several important properties of the three-minute umbral oscillations inside sunspots -- the oscillations of intensity and Doppler velocity with periods of 2 to 3 minutes. The oscillations usually occur in the form of a time series of oscillation packets each of which lasts 10 to 20 minutes, not as continuous trains. Each oscillation packet is characterized by a singly peaked power spectrum of velocity oscillation. The oscillations propagate in the vertical direction from the photosphere to the corona. In the upper chromosphere, they develop into shocks that eventually collide with the transition region. When shocks propagate along a highly inclined direction, the merging of two successive shocks can take place. Once they enter the corona, they change to linear compressional waves. In the image plane, the three-minute oscillations propagate with high speeds in the transverse direction as well, usually propagating radially outwards from a point, and sometimes accompanying spiraling patterns of Doppler velocity. These observational properties can be theoretically explained by postulating the spatio-temporally localized source of fast MHD waves at a depth of about 2000 km below the surface, the excitation of slow MHD waves via mode conversion near the photosphere, and the resonance of the slow waves in the photospheric layer below the temperature minimum, and the nonlinear development of slow waves in the chromosphere.

[구 SS-02] Parametric study of ICME properties affecting space weather disturbances at 1 AU

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Interplanetary coronal mass ejections (ICMEs)

are regarded as one of the most powerful sources of space weather disturbances observed near the Earth orbit (1 AU). In this study, we aim at investigating the relation between these disturbances and the physical properties of an ICME. Toward this end, we used an spheromak-type ICME and performed a series of three-dimensional magnetohydrodynamic (MHD) simulations with different sets of ICME parameters. The ICME is injected into the background solar wind generated from near-Sun data and interplanetary scintillation (IPS) data via an MHD-IPS tomography method. We will compare simulation results to in situ observations near the Earth and discuss how the physical properties of an ICME affect the space weather disturbances at 1 AU.

[ㄱ SS-03] Stability Analysis of the Magnetic Structures Producing an M6.5 Flare in active region 12371

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The stability analysis of coronal magnetic structures is important for studying the initiation of solar flares and eruptions. In order to understand the flare onset process, we first reconstructed the 3D coronal magnetic structures of active region 12371 with an M6.5 flare using a nonlinear force-free field (NLFFF) model based on vector magnetic fields. The NLFFFs successfully produce the observed sigmoidal structure which is composed of two branches of sheared arcade loops. The stability analysis were examined for three representative MHD instabilities: the kink, the torus, and the double arc instabilities. Our stability analysis shows that the two branches of sheared arcade loops are quite stable against the kink and torus instabilities, but unstable against the double arc instability before the flare occurrence. Finally, we discuss a probable onset process of the M6.5 flare.

[ㄱ SS-04] Subsurface origin of merging and fragmentation in AR10930

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The aim of this study is to demonstrate the

subsurface origin of the complex observed evolution of the solar active region 10930 (AR10930) associated with merging and breakup of magnetic polarity regions at the solar surface. This is important for a comprehensive understanding of observed properties of the active region, because subsurface magnetic flux and subsurface dynamical processes are seamlessly connected to surface magnetic flux and surface dynamical processes, respectively. In other words, the solar surface does not behave as an impermeable boundary towards magnetic flux and dynamical processes.

In this talk, we show a magnetohydrodynamic (MHD) model of merging and fragmentation in AR10930. We then discuss what physical processes could be involved in the characteristic evolution of an active region magnetic field that leads to the formation of a sunspot surrounded by satellite polarity regions.

[ㄱ SS-05] Origin and formation mechanism of LASCO-C2 post CME blobs observed on 2017 September 10

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To find out the origin and formation mechanism of LASCO-C2 post-CME blobs, we investigate 2 LASCO-C2 blobs and 35 low corona blobs observed by K-Cor on 2017 September 10 from 17:11 to 18:58 UT. By visual inspection of a post-CME ray and the locations of low corona blobs in K-Cor and LASCO-C2 images with examining the time-height data of all blobs, we find the following results: (1) The post-CME ray structure is well identified in the K-Cor images than LASCO-C2 ones. (2) Low corona blobs can be classified into two groups according to their formation mechanisms: 27 blobs belong to Group 1, generated by the tearing mode instability near the middles of current sheets as described by Furth et al., 1963; Shibata & Tanuma, 2001; Shen et al., 2011, the others belong to Group 2, formed by the tearing mode instability near the tips of current sheets as shown in Figure 5 of Sitnov et al., 2002. (3) Group 1 has low initial appearance heights <1.30 Rs>, broad speed range (38 ~ 945 km/s), and high accelerations <4,272 m/s²> than Group 2, which has initial appearance heights <1.72 Rs>, speed range (579 ~ 843 km/s), and accelerations <1,413 m/s²>. (4) among 8 blobs for Group 2, only 2 blobs are temporally and spatially associated with 2 LASCO-C2 ones and their initial observation heights are 1.93 and 1.79