hence evolution of cluster galaxies. We also discuss the origin of extraplanar 13CO, 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

Junsup Shim (심준섭) , Changbom Park (박창범), Juhan Kim (김주한)
Korea Institute for Advanced Study (고등과학원)

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] ΛLT(Lambda-Lemaître-Tolman) solution for the Hubble Tension

Seong-Yeon Yang
Department of Astronomy and Atmospheric Sciences
Graduate School, Kyungpook National University

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 (ΛLT) 모형을 사용하였다. 우리로부터 먼 현상은 기존의 ΛCDM(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 ΛLT 모형의 변수들을 탐색하였다.

태양/태양계

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

Jongchul Chae, Kyuhyoun Cho, Juhyeong Kang, Hannah Kwak, Kyeore Lee
Department of Physics and Astronomy, Seoul National University (서울대)

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

Junmo An[1], Tetsuya Magara[1,2], Keiji Hayashi[3], Yong-Jae Moon[1,2]
[1]School of Space Research, Kyung Hee University
[2]Department of Astronomy and Space Science, Kyung Hee University [3]NorthWest Resarch Associates (NWRA)

Interplanetary coronal mass ejections (ICMEs)