

scenarios of formation of these transitional galaxies.

### [포 GC-10] Nonlinear Color-Metallicity Relations of Globular Clusters: an Observational Approach

Hak-Sub Kim and Suk-Jin Yoon  
*Department of Astronomy & Center for Galaxy Evolution Research, Yonsei University*

The origin of globular cluster (GC) color bimodality, which is one of the salient phenomena observed in most large galaxies, has not yet been fully resolved. The phenomenon has conventionally been interpreted as a bimodal metallicity distribution based on an assumption of linear GC color-metallicity relations (CMRs). Recent studies however suggest that nonlinear GC CMRs can cause a bimodal color distribution even from a single-peaked metallicity spread. Using photometric and spectroscopic data on GCs in NGC 5128 (Cen A) and NGC 4594 (Sombrero), we investigate the nonlinearity of GC CMRs and compare the observed GC CMRs with the predictions of stellar population simulation models. Our careful selection of old GCs effectively reduces the scatter and reveals the nonlinear nature of the GC CMRs for various colors. The overall shape of the observed CMRs agrees well with that of the modeled CMRs, while offsets are present for some colors. We discuss the implications of our results in terms of the GC color bimodality and GC formation in NGC 5128 and NGC 4594.

## 우주론/암흑물질에너지

### [포 CD-01] A Study of Halo-Galaxy Correspondence from the Horizon Run 4

Jisook Park<sup>1,2</sup>, Juhan Kim<sup>3</sup>, Changbom Park<sup>2</sup>, Sungsoo S. Kim<sup>1,4</sup>

<sup>1</sup>*School of Space Research, Kyung Hee University,*  
<sup>2</sup>*School of Physics, Korea Institute for Advanced Study,*  
<sup>3</sup>*Center for Advanced Computation, Korea Institute for Advanced Study,*  
<sup>4</sup>*Department of Astronomy and Space Science, Kyung Hee University*

The Horizon Run 4 is a huge cosmological simulation intended for the study of evolution of dark matter halos in a side of volume of 3150 h-1 Mpc.

Using the halo merger trees of most bound

particles, we test various models on the survivals of satellites in clusters and will compare them with observed satellite galaxies in a one-to-one correspondence model.

We estimate the abundances of central and satellite subhalos, and compare them with the SDSS main-galaxy group catalogue provided by Tempel et al. (2014).

Based on these comparisons we will study the mass-to-light relations, environmental effects on morphology and luminosity function, halo occupations in clusters, and nonlinear dynamics of clusters of galaxies.

### [포 CD-02] Cosmological Research with Isolated Galaxy Pairs

Hanwool Koo, Jounghun Lee  
*Department of Physics and Astronomy, Seoul National University*

고립된 은하쌍 내의 두 은하의 스핀 각운동량의 각도 차이의 분포를 구하고 이를 통계적으로 분석한 결과를 관측 데이터와 수치 시뮬레이션 데이터 간에 비교함으로써  $\Lambda$ CDM 모형이 아닌 다른 우주 모형의 주요 변수를 규제할 수 있다. 이 연구에서는 결합된 암흑 에너지 (coupled dark energy, cDE) 모형의 주요 변수인 결합 함수를 규제하기 위해 서로 다른 조건의 cDE 모형과  $\Lambda$ CDM 모형에 따라서 생성한 수치 데이터의 스핀 정렬을 Argudo-Fernandez et al. (2015) 에서 인용한 관측 데이터의 스핀 정렬과 비교하였고,  $\Lambda$ CDM 모형과 대부분의 cDE 모형의 수치 데이터는 관측 데이터와 부합하나 일부 cDE 모형은 부합하지 않아서 제외될 가능성이 높음을 확인하였다.

### [포 CD-03] Convolution and Deconvolution Algorithms for Large-Volume Cosmological Surveys

KeunWoo Park, Graziano Rossi  
*Department of Physics and Astronomy, Sejong University, 209 Neungdong-ro, Gwangjin-gu Seoul, South Korea*

Current and planned deep multicolor wide-area cosmological surveys will map in detail the spatial distribution of galaxies and quasars over unprecedented volumes, and provide a number of objects with photometric redshifts more than an order of magnitude bigger than that of spectroscopic redshifts. Photometric information is statistically more significant for studying cosmological evolution, dark energy, and the expansion history of the universe at a fraction of the cost of a full spectroscopic survey, but