spin-orbit angle distribution. We find a clear preference for prograde orientations (i.e., SOA), which is more prominent for closer pairs. The SOA is stronger for less massive targets in lower-density regions. The SOA witnessed at z = 0 has been developed progressively since z = 2. There is a clear positive correlation between the alignment strength and the interaction duration with its current neighbor. Our results suggest the scenario in which the SOA is developed mainly by interactions with a neighbor for an extended period of time, rather than by the primordial torque exerted by the large-scale structure.

[구 GC-04] Star-Gas Misalignment in Galaxies: II. Origins Found from the Horizon-AGN Simulation

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There have been many studies aiming to reveal the origins of the star-gas misalignment found in galaxies, but there still is a lack of understanding of the contribution from each formation channel candidate. We explore the properties, origins, and lifetimes of the star-gas misalignment using Horizon-AGN, a large-volume cosmological simulation. First, the misalignment fraction shows a strong anti-correlation with the kinematic morphology (V/sigma) and the cold gas fraction of the galaxy. This result is consistent with the result of integral field spectroscopy observations. Second, we have identified four main formation channels of misalignment and quantified their level of contribution: mergers (35%), interaction with nearby galaxies (23%), interaction with dense environments or their central galaxies (21%), and secular evolution including smooth accretion from neighboring filaments (21%). Third, the decay timescale of the misalignment is strongly linked with the kinematic morphology of the galaxy: early-type galaxies (2.28 Gyr) tend to have a longer misalignment lifetime than LTGs (0.49 Gyr). We also found that the morphology and cold gas fraction are both and independently anti-correlated with the misalignment lifetime.

[구 GC-05] Cosmological N-body simulations for Intracluster Light using the Galaxy Repacement Technique

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Intracluster light (ICL) is composed of the stars diffused throughout the galaxy cluster but does not bound to any galaxy. The ICL is a ubiquitous feature of galaxy clusters and occupies a significant fraction of the total stellar mass in the cluster. Therefore, the ICL components are believed to help understand the formation and evolution of the clusters. However, in the numerical study, one needs to perform the high-resolution cosmological hydrodynamic simulations, which require an expensive calculation, to trace these low-surface brightness structures (LSB). Here, we introduce the Galaxy Replacement Technique (GRT) that focuses on implementing the gravitational evolution of the diffused ICL structures without the expensive baryonic physics. The GRT reproduces the ICL structures by a multi-resolution cosmological N-body re-simulation using a full merger tree of the cluster from a low-resolution DM-only cosmological simulation and an abundance matching model. Using the GRT, we show the preliminary results about the evolution of the ICL in the on-going simulations for the various clusters.

[구 GC-06] Particle Tagging Method to Study the Formation and Evolution of Globular Clusters in Galaxy Clusters

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Globular clusters (GCs) form at the very early stage of galaxy formation, and thus can be used as an important clue indicating the environment of the galaxy formation era. Although various GC formation scenarios have been suggested, they have not been examined in the cosmological context. Here we introduce the ‘particle tagging method’ in order to investigate the formation scenarios of GCs in a galaxy cluster. This method is able to trace the evolution of GCs that form in the dark matter halos which undergo the hierarchical merging events in galaxy cluster environments with an effective computational time. For this we use dark matter merger trees from the cosmological N-body simulation. Finally, we would like to find out the best GC formation scenario which can explain the observational properties of GCs in galaxy clusters.