Session:	**[B2C-4] S4 : Galaxies, AGN and Cosmology**
Date:	August 19, 2014 (Tuesday)
Time:	16:00~17:30
Room:	Room D (Room 105~106)
Chair:	Jong-Hak Woo (Seoul National University)

[B2C-4-1] **16:00~16:20**

[Invited] Merger Relics in Galaxy Clusters

Sukyoung K. Yi (Yonsei University, Korea)

According to the classical dynamics, galaxy mergers are expected to be extremely rare in clusters due to high speeds of motion. We performed a deep (r-band surface brightness limit of 28 mag/arcsec^2) imaging survey on four rich clusters of galaxies using the CTIO 4m Blanco Telescope and found that a large fraction (40%) of bright member galaxies show strong post-merger features contrary to the theoretical expectation. We performed theoretical calculations on galaxy mergers in cluster environments using semi-analytic approaches and hydrodynamic simulations to understand this. Our calculations confirm that in-situ galaxy mergers are indeed rare in clusters and suggest that many of these post-merger galaxies are instead relics of mergers that happened before they fell into the current cluster. It is critical to consider realistic halo merger histories in the first place to understand galaxy evolution accurately. Physical and realistic modeling of galaxies seems finally possible.

[B2C-4-2] **16:20~16:35**

A Suite of Hydrodynamical Simulations for the Lyman-Alpha Forest with Massive Neutrinos

Graziano Rossi (Sejong University, Korea), Nathalie Palanque-Delabrouille, Arnaud Borde, Matteo Viel, Christophe Yeche, James Bolton, James Rich, and Jean-Marc Le Goff

The signature left in quasar spectra by the presence of neutral hydrogen in the Universe allows one to constrain the sum of the neutrino masses with improved sensitivity, with respect to laboratory experiments, and may shed a new light on the neutrino mass hierarchy and on the absolute mass scale of neutrinos. However, this requires a detailed modeling of the line-of-sight power spectrum of the transmitted flux in the Lyman-α (Lyα) forest, which in turns demands the inclusion and careful treatment of cosmological neutrinos. To this end, we present here a suite of state-of-the-art hydrodynamical simulations with cold dark matter, baryons and massive neutrinos, specifically targeted for modeling the low- density regions of the intergalactic medium (IGM) as probed by the Lyα forest at high-redshift. The simulations span volumes ranging from (25 Mpc/h)3 to (100 Mpc/h)3, and are made using either 3×1923 ≃ 21 million or 3×7683 ≃ 1.4 billion particles. The resolution of the various runs can be further enhanced, so that we can reach the equivalent of 3 × 30723 ≃ 87 billion particles in a (100 Mpc/h)3 box size. We adopt a particle-type implementation of massive neutrinos, and consider three degenerate species having masses Mv = 0.1, 0.2, 0.3, 0.4 and 0.8 eV, respectively. We improve on previous studies in several ways, in particular with updated routines for IGM radiative cooling and heating processes, and initial conditions based on second-order Lagrangian perturbation theory (2LPT). This allows us to safely start our runs at relatively low redshift, a fact that reduces the shot noise contamination in the neutrino component and the CPU consumption. Besides providing technical details on the simulations, we present the first analysis of the nonlinear 3D and 1D matter and flux power spectra from these models, and characterize the statistics of the transmitted flux in the Lyα forest including the effect of massive neutrinos. In synergy with recent data from the Baryon Acoustic Spectroscopic Survey (BOSS) and the Planck satellite, and with a grid of corresponding neutrino-less simulations, our realizations will allow us to constrain cosmological parameters and neutrino masses directly from the Lyα forest with improved sensitivity. In addition, our simulations can be useful for a broader variety of cosmological and astrophysical applications, ranging from the three-dimensional modeling of the Lyα forest to

cross-correlations between different probes, the study of the expansion history of the Universe in presence of massive neutrinos, and particle physics related topics. Moreover, while our simulations have been specifically designed to meet the requirements of the BOSS survey, they can also be used for upcoming or future experiments – such as eBOSS and DESI.

[B2C-4-3] **16:35~16:50**

UV Properties of Post-merger Galaxies in Rich Abell Clusters at z ≲ 0.1

Yun-Kyeong Sheen (University of Concepción, Chile) and Sukyoung K. Yi

Galaxy clusters are dominated by massive early-type galaxies in the nearby Universe. The massive galaxies in cluster environment are supposed to form at early epoch in a short timescale based on their observational properties and the theoretical galaxy formation scenario. However, we found evidence which demonstrates that a significant fraction of the cluster galaxies have gone through mass-assemblies at recent epoch ($z < 0.5$) using deep optical images. Actually the fraction of post-merger galaxies in rich Abell clusters was comparable to the fraction of the field ellipticals (38% vs 49% for cluster and field). We interpreted this as a result of continuous halo mergers in the Universe. Some of massive early-type galaxies in galaxy clusters may have carried over their merger features from their previous halo environment (Sheen et al. 2012). All of our cluster samples have very deep GALEX UV images. Taking advantage of the deep UV data, we have investigated recent star formation history of the cluster galaxies and examined a correlation with their post-merger signatures. Furthermore, morphological features of post-merger galaxies and their spatial distribution in cluster halo will be discussed.

[B2C-4-4] **16:50~17:05**

Radio Variability and Random Walk Noise Properties of Four Blazars

Jong-Ho Park (Seoul National University, Korea) and Sascha Trippe

The strong and complex temporal flux variability of active galactic nuclei provides valuable information on the internal conditions of accretion zones and plasma outflows. Blazars, characterized by violent flux variability across the entire electromagnetic spectrum, are an extreme subset of AGNs which include BL Lacertae (BL Lac) objects and flat spectrum radio quasars (FSRQs). We present the results of a time series analysis of the long-term light curves of four blazars: 3C 279, 3C 345, 3C 446, and BL Lacertae. We exploit the database of the University of Michigan Radio Astronomy Observatory monitoring program which provides densely sampled light curves spanning 32 years in time in three frequency bands located at 4.8, 8, and 14.5 GHz. Our sources show mostly flat or inverted (spectral indices $-0.5 < \alpha < 0$) spectra, in agreement with optically thick emission. All light curves show strong variability on all timescales. Analyzing the time lags between the light curves from different frequency bands, we find that we can distinguish high-peaking flares and low-peaking flares in accordance with the Valtaoja classification. The periodograms (temporal power spectra) of the observed light curves are consistent with random-walk power-law noise without any indication of (quasi-)periodic variability. Random-walk noise light curves are expected to originate from shocks in discontinuous jets. Our observations provide the first direct test of several theoretical jet models. The fact that all four sources studied are in agreement with being random-walk noise emitters at radio wavelengths suggests that such behavior is a general property of blazars. We are going to generalize our approach by applying our methodology to a much larger blazar sample in the near future.

Poster Session **17:05~17:30**

Chairs: **Jong-Hak Woo** (Seoul National University)

Sascha Trippe (Seoul National University)