[Ⅵ-1-3] Origin of Dark-Energy and Accelerating Universe

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After SNIa and WMAP observations during the last decade, the discovery of the accelerated expansion of the universe is a major challenge to particle physics and cosmology. There are currently three candidates for the dark energy which results in this accelerated expansion:
• a non-zero cosmological constant,
• a dynamical cosmological constant (quintessence scalar field),
• modifications of Einstein's theory of gravity.
The scalar field model like quintessence is a simple model with time-dependent w, which is generally larger than −w1. Because the different w lead to a different expansion history of the universe, the geometrical measurements of cosmic expansion through observations of SNIa, CMB and baryon acoustic oscillations (BAO) can give us tight constraints on w. One of the interesting ways to study the scalar field dark-energy models is to investigate the coupling between the dark energy and the other matter fields. In fact, a number of models which realize the interaction between dark energy and dark matter, or even visible matter, have been proposed so far. Observations of the effects of these interactions will offer an unique opportunity to detect a cosmological scalar field. In this talk, after briefly reviewing the main idea of the three possible candidates for dark energy and their cosmological phenomena, we discuss the interactinng dark-energy model, paying particular attention to the interacting mechanism between dark energy with a hot dark matter (neutrinos). In this so-called mass-varying neutrino (MVN) model, we calculate explicitly the cosmic microwave background (CMB) radiation and large-scale structure (LSS) within cosmological perturbation theory. The evolution of the mass of neutrinos is determined by the quintessence scalar field, which is responsible for the cosmic acceleration today.

[Ⅵ-1-4] Nonlinear evolution of the relativistic Weibel instability driven by anisotropic temperature

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The relativistic Weibel instability has drawn attention as a main mechanism of the magnetic generation in the core of galaxies or in the formation of universe. The Weibel instability is not yet fully understood in the relativistic region. We investigated nonlinear saturation and decay of the relativistic Weibel instability. It is found that the early phase of the instability is in excellent agreement with the linear theory. But, an analysis based on an alternative magnetic trapping saturation theory reveals that a substantial discrepancy between the theory and simulation is revealed in the relativistic regime in contrast to an excellent agreement in the non-relativistic regime. The analysis of the Weibel instability beyond the quasilinear saturation stage shows an inverse cascade process via a nonlinear decay instability involving electrostatic fluctuation.

■ Session : 은하
10월 30일(금) 17:15 – 19:00 제1발표장

[(초)Ⅶ-1-1] Satellite Overquenching Problem

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We have investigated the recent star formation history of the nearby galaxies using the SDSS optical and Galex UV data. To everyone's surprise, we found that roughly 30 percent of elliptical galaxies had a residual star formation in the last billion years, suggesting that residual star formation has been common even in ellipticals. Galaxy evolution models based on semi-analytic prescriptions including AGN feedback reasonably reproduce the star formation properties of elliptical galaxies. However, we found that the current galaxy models miserably fail to reproduce the star formation properties of satellite disc galaxies in cluster environments. Satellite disc galaxies in models are overly star-formation quenched in comparison to observation. Detailed investigations led us to conclude that this is due to the use of inaccurate prescriptions for the gas content evolution in the model. I present a solution to the problem by adopting more realistic physical prescriptions.

[Ⅶ-1-2] Demography of SDSS Early-type galaxies from the perspective of radial color gradients

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We have studied the radial g-r color gradients of early-type

galaxies in the Sloan Digital Sky Survey (SDSS) DR6 in the redshift range 0.00 < z < 0.06. The color profiles of ~30 per cent of the galaxies in this sample show positive color gradients (centers being bluer). These positive gradient galaxies often show strong Hβ absorption line strengths or emission line ratios that are consistent with star-forming populations. Combining the optical data with Galaxy Evolution Explorer (GALEX) UV photometry, we find that all positive gradient galaxies show blue UV-optical colors. They also exhibit a tendency of having a lower stellar velocity dispersion. Positive gradient galaxies tend to live in lower density regions than negative gradient galaxies and are likely to have a late-type companion galaxy. On the other hand, massive early-type galaxies show negative color gradients. A simplistic population analysis shows that these positive color gradients are visible only for half a billion years after a star burst. Although the effective radius decreases and mean surface brightness increases due to this centrally concentrated star formation, the positions of the positive gradient galaxies on the fundamental plane cannot be reproduced by any amount of recent star formation. Instead it required a lower velocity dispersion.

[Ⅶ-1-3] Improved spectral line measurements of the SDSS galaxy spectra

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We have established a database of galaxy spectral line strengths for the SDSS database using an improved line measuring method. Our work includes the entire SDSS DR7 galaxies within redshift of 0.2. The absorption line strengths measured by the SDSS pipeline are seriously contaminated by emission filling. Our code, GANDALF (gas and absorption line fitting code) performs more accurate measurements by effectively separating emission lines from absorption lines. A significant improvement has also been made on the velocity dispersion measurement, more notably in late-type galaxies. We have also identified a number of broad line region galaxies which were misclassified as normal galaxies by the SDSS pipeline. We developed an effective method measuring their line strengths. The database will be provided with new parameters that are indicative of the line strength measurement quality. In addition, we made galaxy templates for the Hubble sequence. The database will be useful for many fields of galaxy studies including star formation and AGN activities.

[Ⅶ-1-4] Tidal Dwarf Galaxies around a Post-Merger Galaxy, NGC 4922

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One possible channel for the formation of dwarf galaxies involves birth in the tidal tails of interacting galaxies. We report the detection of a bright UV tidal tail and several young tidal dwarf galaxy candidates in the post-merger galaxy NGC 4922 in the Coma cluster. Based on a two-component population model (combining young and old stellar populations), we find that its light predominantly comes from young stars (a few Myr old). The Galaxy Evolution Explorer (GALEX) ultraviolet data played a critical role in the parameter (age and mass) estimation. Our stellar mass estimates of the tidal dwarf galaxy candidates are ~10^{6-7} M_sun, typical for dwarf galaxies.

[Ⅶ-1-5] The Asymptotic Giant Branch Stars in Nearby Dwarf Galaxies, NGC 6822, IC 1613, and NGC 205

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To investigate properties of the stellar contents of the resolved asymptotic giant branch stars in the nearby dwarf galaxies, we obtained wide-field JHKs images of the dwarf irregular galaxies NGC 6822, IC 1613 and the dwarf elliptical galaxy NGC 205, using the WIRCam near-infrared imager of the CFHT. The obtained (J-Ks, Ks) and (H-Ks, Ks) color-magnitude diagrams for the resolved stars in the galaxies contain populations of foreground stars, super giant stars, red giant stars and the asymptotic giant branch (AGB) stars. Using corollary photometric data in the visible bands, AGB stars were selected in the color-magnitude diagrams with a wide wavelength baseline in color indices. In color-color diagrams of the resolved AGB stars, we identified C stars from M giant stars for each galaxies, i.e., 726 C stars in NGC 6822, 126 C stars in IC 1613 and 593 C stars in NGC 205. The number ratios of C stars to M-giants were estimated to be 0.59±0.03 in NGC 6822,