[구 GC-12] Lyα Radiative Transfer and The Wouthuysen-Field effect

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A three-dimensional (3D) Lyα radiative transfer code is developed to study the Wouthuysen-Field effect, which couples the 21 cm spin temperature of neutral hydrogen and the Lyα radiation field, and the escape fraction of Lyα from galaxies. The Monte Carlo code is capable of treating arbitrary 3D distributions of Lyα source, neutral hydrogen and dust densities, gas temperature, and velocity field. It is demonstrated that the resonance-line profile at the center approaches to the Boltzmann distribution with the gas temperature. A plane-parallel ISM model, which is appropriate for the neutral ISM of our Galaxy, is used to calculate the Lyα radiation field strength as a function of height above the galactic plane. We also use a two-phase, clumpy medium model which is composed of the cold and warm neutral media (WNM). It is found that the Lyα radiation field is strong enough to thermalize the 21 cm spin temperature in the WNM to the gas kinetic temperature. The escape fraction of Lyα is found to be a few percent, which is consistent with the Ly α observations of our Galaxy and external galaxies.

[구 GC-13] Discovery of a significant population of CN-enhanced red clump stars in the Milky Way bulge: Implications for the formation of early-type galaxies

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We report our discovery of a significant population of CN-enhanced red clump stars in the classical bulge component of the Milky Way. Since CN-rich stars trace a population with enhanced Helium, Nitrogen, and Sodium originated in globular clusters (GCs), this is a direct evidence that proto-GCs were the major building blocks in the formation of the classical bulges and early-type galaxies in the hierarchical merging paradigm.

[구 GC-14] Three-Dimensional Structure of Star-Forming Regions in NGC 6822 Hubble V

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NGC 6822 is a dwarf irregular galaxy in the Local Group and it is located in 500 kpc, further than the Large Magellanic Cloud and the Small Magellanic Cloud. Therefore, we can study star-forming processes by local condition in NGC 6822 instead of tidal force of the Galactic gravitational field. Hubble V is the brightest of several H II complexes in this galaxy. We observed Hubble V by using IGRINS attached on the 2.7 m telescope at the McDonald Observatory in Texas, US in May 2016. We performed a spectral mapping of 15″x 7″area on H and K bands, and detected emission lines of bright Brγ λ2.1661 μm and weak He I λ2.0587 μm. Molecular hydrogen lines of 1-0S(1) λ2.1218 μm, 2-1 S(1) λ2.2477 μm, and 1-0 S(0) λ2.2227 μm was also detected. These emission lines show the structure of an ionized core and excited surface of clouds by far-ultraviolet photons, photodissociation region (PDR). We present three-dimensional maps of emission line distributions through multi slit scanning data and compare these results with the previous study. This presentation shows the physical structure of the star-forming regions and we discuss a PDR model and an evolution of Hubble V complex.

[구 GC-15] Bar Fraction in Early-type and Late-type

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Bar fractions depend on the properties of host galaxies. However, the observational studies did not provide consistent tendency. We investigated the bar fractions and their dependence on properties of host galaxies using three bar classifications: visual inspection, ellipse fitting method and Fourier analysis from a volume-limited sample of 1,698 disk galaxies brighter than Mr=-15.2 within z = 0.01 from the Sloan Digital Sky Survey (SDSS) Data Release 7 (DR7). We found two causes to make the discrepancy in previous studies. One is caused by