Although mass accretion from the disk to the central protostar is a key process of low mass star formation, the accretion mechanism is still poorly understood. To investigate "episodic accretion", which has been suggested as an accretion mechanism in low mass star formation, we have carried out near-infrared spectroscopic observations of three very low-luminosity objects (VeLLOs) and one background source, using InfraRed Camera onboard the AKARI space telescope. The ice absorption features of H_2O, CO_2, and CO were detected around the wavelengths of 3.0, 4.26, and 4.67 μm, respectively. In addition, we revealed the XCN ice feature, which is attributed to high energy UV photons produced by the episodic burst accretion. The comparisons of the ice abundances of our targets with those of other YSOs observed previously with AKARI IRC imply that the three VeLLOs had experienced burst accretions although they are now in a very quiescent phase.

[석 IM-09] New insights on the origin of multiple stellar populations in globular clusters

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In order to investigate the origin of multiple stellar populations in the halo and bulge of the Milky Way, we have constructed chemical evolution models for the low-mass proto-Galactic subsystems such as globular clusters. Unlike previous studies, we assume that supernova blast waves undergo blowout without expelling the pre-enriched gas, while relatively slow winds of massive stars, together with the winds and ejecta from low and intermediate mass asymptotic-giant-branch stars, are all locally retained in these less massive systems. We find that the observed Na-O anti-correlations in metal-poor GCs can be reproduced when multiple episodes of starbursts are allowed to continue in these subsystems. A specific form of star formation history with decreasing time intervals between the stellar generations, however, is required to obtain this result, which is in good agreement with the parameters obtained from our stellar evolution models for the horizontal-branch. The "mass budget problem" is also much alleviated by our models without ad-hoc assumptions on star formation efficiency and initial mass function. We also applied these models to investigate the origin of super helium-rich red clump stars in the metal-rich bulge as recently suggested by Lee et al. (2015). We find that chemical enrichments by the winds of massive stars can naturally reproduce the required helium enhancement (dY/dZ = 6) for the second-generation stars. Disruption of proto-globular clusters in a hierarchical merging paradigm would have provided helium enhanced stars to the bulge field.

[구 IM-10] Radial distribution of blue straggler stars in Magellanic Cloud clusters

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Using the high-resolution observational data obtained by the Hubble Space Telescope, we found that there is the diversity of the radial trends of blue straggler stars (BSSs) in young massive clusters (YMCs) in the Large Magellanic Cloud unlike BSSs in old globular clusters usually showing the segregated radial distributions. To understand the dynamical processes that lead to the none-segregated or even inversely-segregated radial distribution of BSSs, we performed direct N-body simulations for YMCs. Our numerical simulations show that the presence of black hole subsystems inside the cluster centre can significantly affect the dynamical evolution of BSSs and eventually lead to none- or inversely-segregated radial distribution of BSSs.

[구 IM-11] An exosolar planetary system *N*-body simulator II

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We present a general N-body exasolar system simulator in anticipation of upcoming searches for exoplanets and even exomoons by next generation telescopes such as James Webb Space Telescope. For habitable zones, traditionally defined by temperature, we here address the essential problem of dynamical stability of planetary orbits. Illustrative examples are presented on P-type orbits in stellar binary systems, that should be fairly common as in Kepler 16b. Specific attention is paid to reduced orbital lifetimes of exoplanets in the habitable zone by the stellar binary, that is propoesed by Maurice van Putten (2017). Especially, we focused on a classic work of complex three-body problem that is well known by Dvorak(1986). We charge his elliptic restricted three-body problem to extend unrestricted three-body problem to look into dynamical motions in view of circumbinary planet, furthermore, we suggest that opposite angular orientation of the planet is relative to the stability of orbits. In here, counter-rotation case is relatively more faster than co-rotation case for being stable. As a result, we find that various initial conditions and thresholds to approach dynamical stability and unstability with unexpectable isolated islands over enormous parameter space. Even, superkeplerian effect of binary is important to habitability of the exoplanet and we can verify that superfaster binary doesn't effect on th planet and increases survivality of planet around the binary.

적외선 영상분광 탐사미션과 활용연구

[구 NS-01] An exosolar planetary system *N*-body simuInfrared Spectro-Photometric Survey in Space: NISS and SPHEREx Missions

Woong-Seob Jeong[1,2], Minjin Kim[1,2], Myungshin Im[3], Jeong-Eun Lee[4], Jeonghyun Pyo[1], Yong-Seon Song[1,2], Sung-Joon Park[1], Bongkon Moon[1], Dae-Hee Lee[1], Won-Kee Park[1], Youngsoo, Jo[1], Duk-Hang Lee[1], Kyeongyeon Ko[1,2], Il-Joong Kim[1], Youngsik Park[1], Yujin Yang[1,2], Jongwan Ko[1], Hyung Mok Lee[3], Hyunjin Shim[5], Goo-Hwan Shin[6], Jangsoo Chae[6], Toshio Matsumoto[1,7], NISS Team[1,2,3,4,5,6] / SPHEREx Korean Consortium[1,2,3,4,5,7,8]
[1]Korea Astronomy and Space Science Institute, Korea, [2]University of Science and Technology, Korea, [3]Seoul National University, Korea, [4]Kyung Hee University, Korea, [5]Kyung-Book National University, Korea, [6]Satellite Technology & Research Center, KAIST, Korea, [7]ISAS/JAXA, Japan, [8]Korea Institute for Advanced Study, Korea

The NISS (Near-infrared Imaging Spectrometer for Star formation history) onboard NEXTSat-1 have successfully developed by KASI. The capability of both imaging and spectroscopy is a unique function of the NISS. At first, it have realized the low-resolution spectroscopy (R~20) with a wide field of view of 2 x 2 deg. in a wide near-infrared range from 0.95 to 2.5μm. The major scientific mission is to study the cosmic star formation history in local and distant universe. It will also demonstrate the space technologies related to the infrared spectro-photometry in space. Now, the NISS is ready to launch in late 2018. After the launch, the NISS will be operated during 2 years.

As an extension of the NISS, the SPEHREx (Spectro-Photometer for the History of the Universe Epoch of Reionization, and Ices Explorer) is the NASA MIDEX (Medium-class Explorer) mission proposed together with KASI (PI Institute: Caltech). It will perform the first all-sky infrared spectro-photometric survey to probe the origin of our Universe, to explore the origin and evolution of galaxies, and to explore whether planets around other stars could harbor life. Compared to the NISS, the SPHEREx is designed to have much more wide FoV of 3.5 x 11.3 deg. as well as wide spectral range from 0.75 to 5.0μm. After passing the first selection process, the SPHEREx is under the Phase-A study. The final selection will be made in the end of 2018. Here, we report the status of the NISS and SPHEREx missions.

[구 NS-02] Extragalactic Science I

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In this talk, we will review extragalactic science cases with NISS and SPHEREx. With its capability to perform a low resolution spectroscopy over a wide area, NISS and SPHEREx can provide valuable information about the evolution of spectral shapes of galaxies in different environments over cosmic history. This talk will focus on the cases for the studies that are closely related to the galaxy evolution and formation.

[구 NS-03] Extragalactic Science with SPHEREx II

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SPHEREx is a proposed MIDEX mission, planned to conduct spectral imaging survey to cover 0.75-5 um with a spectral resolution of R~40-135. We will briefly overview the uniqueness of SPHEREx data, and how Korean community can take advantage of it. We will present extragalactic science cases that can be addressed with SPHEREx dataset. In particular, SPHEREx survey will uniquely provide the variability information of bright QSOs, both in continuum and fluxes of emission lines, which enables us to investigate the central structures of QSOs through the reverberation mapping method. SPHEREx will also allow us to understand how supermassive black holes and host galaxies