우리은하 및 외계행성

[구 GE-01] Dependence of Halo Properties on Galactic Potentials

Youngkwang Kim[1], Young Sun Lee[1], Timothy C. Beers[2]
[1]Department of Astronomy and Space Science, Chungnam National University, Daejeon 34134, Korea
[2]Department of Physics and JINA Center for the Evolution of the Elements, University of Notre Dame, Notre Dame, IN 46556, USA

We present the dependence of halo properties on two different Galactic potentials: the $St\ddot{a}ckel$ potential and the Milky Way-like potential known as "Galpy". Making use of the Sloan Digital Sky Survey Data Release 12 (SDSS DR12), we find that the shape of the metallicity distribution and rotation velocity distribution abruptly changes at 15 kpc of $Z_{\max}$ (the maximum distance of stellar orbit above or below the Galactic plane) and 32 kpc of $r_{\max}$ (the maximum distance of an orbit from the Galactic center) in the $St\ddot{a}ckel$, which indicates that the transition from the inner to outer halo occurs at those distances. When adopting the $St\ddot{a}ckel$ potential, stars with $Z_{\max}$ > 15 kpc show a retrograde motion of V_ϕ = -60 $km\,s^{-1}$, while stars with $r_{\max}$ > 32 kpc show V_ϕ = -150 $km\,s^{-1}$. If we impose V_ϕ < -150 $km\,s^{-1}$ to the stars with $Z_{\max}$> 15 kpc or $r_{\max}$> 32, we obtain the peak of the metallicity distribution at [Fe/H] = -1.9 and -1.7 respectively. However, there is the transition of the metallicity distribution at $Z_{\max}$ = 25 kpc, whereas there is no noticeable retrograde motion in the Galpy. The reason for this is that stars with high retrograde motion in the $St\ddot{a}ckel$ potential are unbound and stars with low rotation velocity reach to larger region of $Z_{\max}$ and $r_{\max}$ due to shallower potential in the Galpy. These results prove that as the adopted Galactic potential can affect the interpretation of the halo properties, it is required to have a more realistic Galactic potential for the thorough understanding of the dichotomy of the Galactic halo.

[구 GE-02] Ca-CN Photometry of M5: A New Saga Begins

Jae-Woo Lee
Department of Physics and Astronomy, Sejong University

As a result of our decade-long effort, we developed a new approach wherein small-aperture telescope powered by ingeniously designed narrow-band filter systems can have the capability to measure not only the heavy but also the lighter elemental abundances of the red-giant branch (RGB) and asymptotic-giant branch (AGB) stars in the globular clusters. Our novel approach can complement the intrinsic weakness of the results from the prestigious instruments, such as HST and the VLT. In our talk, we will present the multiple stellar populations of the RGB and the AGB stars in M5, as a pilot work.

[구 GE-03] On an N-body exoplanet simulator

Hong Chaelin, Maurice H.P.M van Putten
Sejong university, Astronomy & Space science department

We present a general N-body exoplanet simulator in anticipation of upcoming next generation telescopes. Illustrative examples are presented on P-type orbits in stellar binary stellar systems, that should be fairly common as in Kepler 16AB. Specific attention is paid to reduced orbital lfetimes of exoplanets in the habitable zone by the stellar binary, known from Dvorak (1986).

[구 GE-04] Observational Constraints on the Formation of the Milky Way's Disk

Doori Han, Young Sun Lee, Youngkwang Kim, Timothy C. Beers
Department of Astronomy, Space Science, and Geology, Chungnam National University, Daejeon 34134, South Korea, 2Department of Astronomy and Space Science, Chungnam National University, Daejeon 34134, South Korea, 3Department of Physics & JINA-CEE, University Notre Dame, Notre Dame, IN 46556, USA

We present the derived kinematic characteristics of low-α thin-disk and high-α thick-disk stars in the Milky Way, investigated with a sample of about 33,900 G- and K-type dwarfs from the Sloan Extension for Galactic Understanding and Exploration (SEGUE). Based on the level of α -element enhancement as a function of [Fe/H], we separate our sample into thin- and thick-disk stars and then derive mean velocity, velocity dispersion, and velocity gradients for the U, V and W velocity

components, respectively, as well as the orbital eccentricity distribution. There are notable gradients in the V velocity over [Fe/H] in both populations: -23 km s-1 dex-1 for the thin disk and +44 km s-1 dex-1 for the thick disk. The velocity dispersion of the thick disk decrease with increasing [Fe/H], while the velocity

New Frontier of Gravitational Wave Research

[구 GW-01] Superconducting Low-frequency Gravitational-wave Telescope (SLGT): pilot study status report

Chunglee Kim[1], Sang-Hyeon Ahn[1], Yeong-Bok Bae[1], Gungwon Kang[2], Whansun Kim[3], John J. Oh[3], Sang Hoon Oh[3], Chan Park[2], Edwin J. Son[3], Yong Ho Lee[4], Ho Jung Paik[5]
[1]Korea Astronomy & Space Science Institute, [2]Korea Institute of Science and Technology Information, [3]National Institute for Mathematical Sciences, [4]Korea Research Institute of Standards and Science, [5]U. of Maryland (USA)

The discovery of GW150914, black hole - black hole merger via gravitational waves (GWs) opened a new window to observe the Universe. GW frequencies from heavenly bodies and early Universe are expected to span between sub-nHz up to kHz. At present, GW detectors on Earth (LIGO, Virgo, KAGRA, LIGO-India) aims frequency ranges between 10-2000 Hz. The space-borne GW detector and Pulsar Timing Array targets mHz and nHz sources. Starting in March 2017, the KKN (KASI-KISTI-NIMS) collaboration launched a pilot study of SLGT (Superconducting Low-frequency Gravitational-wave Telescope). This project is funded by NST (Korea Institute of Science and Technology). The main detection bands expected for SLGT ranges between 0.1-10Hz, which is complementary of LIGO-type detectors and LISA for multi-band GW observation. We will present an overview of the SLGT project and report the status of the NST pilot study. We will also present prospective of GW astronomy with SLGT.

[초 GW-02] Development of Superconducting Low-frequency Gravitational-wave Telescope (SLGT): Technical Challenge and Feasibility

Yong Ho Lee[1], Sang-Hyeon Ahn[2], Yeong-Bok Bae[2], Gungwon Kang[3], Chunglee Kim[2], Whansun Kim[4], John J. Oh[4], Sang Hoon Oh[4], Chan Park[3], Edwin J. Son[4], Ho Jung Paik[5]
[1]Korea Research Institute of Standards and Science, [2]Korea Astronomy & Space Science Institute, [3]Korea Institute of Science and Technology Information, [4]National Institute for Mathematical Sciences, [5]U. of Maryland (USA)

Recent success of gravitational wave (GW) detection by LIGO opened a new window to expand our understanding of the Universe. In addition to LIGO, several other developments are going on or under planning. However, each of these detectors has a specific sensitive frequency range. There is a missing frequency band, 0.1-10 Hz, where detectors loose sensitivity significantly due to Newtonian noise on the Earth. We introduce a plan to develop a Superconducting Low-frequency Gravitational- wave Telescope (SLGT), which can observe massive black holes in 0.1-10 Hz. The SLGT system consists of magnetically levitated six test masses, superconducting quantum interference devices (SQUIDs), rigid support frame, cooling system, vibration isolation, and signal acquisition. By taking the advantage of nearly quantum-limited low-noise SQUIDs and capacitor bridge transducers, SLGT's detection sensitivity can be improved to allow astrophysical observation of black holes in cosmological distances. We present preliminary design study and expected sensitivity, and its technical feasibility.

[구 GW-03] Optical/NIR Follow-up Observation of GW Sources

Myungshin Im[1], Hyung Mok Lee[1], Changsu Choi[1], Joonho Kim[1], Lim Gu[1], Hyun-Il Sung[2], Yeong-Beom Jeon[2], Seung-Li Kim[2], Chung-Uk Lee[2], Soojong Pak[3] Shuhrat Eghamberdiev[4]
[1]Astronomy Program/CEOU, Dept. of Physics & Astronomy, Seoul National University
[2]Korea Astronomy & Space Science Institute
[3]School of Space Research and Institute of Natural Sciences, Kyunghee University
[4]Ulugh Beg Astronomical Institute, Uzbekistan

Identification of gravitational wave (GW) sources in electromagnetic (EM) wave observations is important because it enables us to understand the property of the GW-emitting sources/mechanisms much better than the GW detection. For that reason, a large number of astronomers are working on observations to identify the position and the nature of GW sources. We give a short