sunspots by analyzing the motion of umbral flashes observed by the IRIS Mg II 2796Å slit-jaw images (SJI). The umbral flashes are believed as shock phenomena developed from upward propagating slow magnetohydrodynamic (MHD) waves. If the MHD waves are generated by convective motion below sunspots, the apparent origin of the umbral flashes known as oscillation center will indicate the horizontal position of convection cells. Thus, the distribution of the oscillation centers is useful to investigate the subsurface structure of sunspots. We analyze the spatial distribution of oscillation centers in the merged sunspot. As a result, we found that the oscillation centers distributed over the whole umbra regardless of the convergent interface between two merged sunspots. It implies that the subsurface structure of the sunspot is not much different from the convergent interface, and supports that many field-free gaps may exist below the umbra as the cluster model expected. For more concrete results, we should confirm that the oscillation centers determined by the umbral flashes accurately reflect the position of wave sources.

항성,항성계/외계행성

[포 SA-01] Current Status of Intensive Monitoring Survey of Nearby Galaxies and Core-Collapse Supernovae Observational Research

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Intensive Monitoring Survey of Nearby Galaxies (IMSNG) is a program monitoring nearby galaxies with a high cadence within a day. The main goal of the project is to constrain the SNe explosion mechanism and properties of their progenitors by catching the early lights from the shock-heated cooling emission. The observation campaign began in 2014 with two 1-m class telescopes in the northern hemisphere. Now more than ten telescopes are monitoring galaxies with 60 IMSNG targets, which have a high probability of supernova explosion every night all around the world. Since the project started, the following observations have been carried out on 14 SNe Ia(including -pec), 27 core-collapse supernovae (CCSNe), and around 40 transients in other types.

In this poster, we present the current status of IMSNG SNe data first and then focus more on the CCSNe. CCSNe are the explosion of massive stars, more massive than eight times of the Sun. They have been studied for more than a half decades but still have key questions to be solved, such as distinct types, the characteristics driving their diversity, and so on. Here, we show our ongoing studies of CCSNe in IMSNG, focusing on their usefulness as distance indicators and properties of early light curves.

[포 SA-02] Identifying clusters of red supergiants in Galactic plane using 2MASS and GAIA G band colors

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Galactic young massive clusters are the ideal laboratories to study massive stellar evolution. Unfortunately, such objects are rare. Of particular interest are so-called Red Supergiant Clusters (RSGCs) that are currently only found toward the Scutum-Crux Galactic arm. Confirming their nature as RSGC is often not straight-fortward as distinguishing RSGs from AGB stars is still difficult even with high spectral resolution spectra. Here we report that broad band colors using 2MASS JHK and GAIA G band data can be useful in reducing the AGB contamination, thus providing selection criteria that effectively reveal the known RSGCs with negligible false positives. On the other hand, we suggest that RSGC4, one of the proposed RSGC candidates, may not be a cluster of RSGs as their colors are not compatible with our selection criteria. We discuss the nature of these stars together with our IGRINS spectroscopic observations. We also employ the same selection criteria to search for RSGC candidates in other parts of the plane, resulting in no prominent candidates.

[포 SA-03] Pushing precision and accuracy of RR Lyrae variables as distance indicators

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RR Lyrae variables are excellent distance indicators thanks to their visual magnitude-metallicity relation and well-defined Period-Luminosity Relations (PLRs) at infrared wavelengths. These population II variables together with the tip of the red giant branch provide primary calibration for the first-rung of the population II distance ladder. We will present new empirical calibration of RR Lyrae PLRs at

near-infrared wavelengths using our data from the ongoing CFHT-WIRCam RR Lyrae program.
We will discuss the systematic uncertainties involved in the calibration of these relations based on the latest Gaia EDR3 parallaxes and the implication for the cosmic distance scale.

[포 SA-04] The Kinematic Properties of Young Stars in NGC 281: its implication on star formation process (NGC 281의 젊은 별들의 운동학적 특성)

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Stellar kinematics is a useful tool to understand the formation and evolution of young stellar systems. Here, we present a kinematic study of the HII region, NGC 821, using the Gaia Early Data Release 3. NGC 281 contains the open cluster IC 1590. This cluster has a core and a low-stellar density halo. We detect a pattern of cluster expansion from the Gaia proper motion vectors. Most stars radially escaping from the cluster are distributed in the halo. We measure the 1-dimensional velocity dispersion of stars in the core. The velocity dispersion (1 km/s) is comparable to the expected virial velocity dispersion of this cluster, and therefore the core is at a virial state. The core has an initial mass function shallower than that of the halo, which is indicative of mass segregation. However, there is no significant correlation between stellar masses and tangential velocities. This result suggests that the mass segregation has a primordial origin. On the other hand, it has been believed that the formation of young stars in NGC 281 West was triggered by feedback from massive stars in IC 1590. We investigate the ages of stars in the two regions, but the age difference between the two regions is not comparable to the timescale of the passage of an ionization front. Also, the proper motion vectors of the NGC 281 West stars relative to IC 1590 do not show any systematic receding motion from the cluster. Our results suggest that stars in NGC 281 West might have been formed spontaneously. In conclusion, the formation of NGC 281 can be understood in the context of hierarchical star formation model.

[포 SA-05] STaRS Gen 2: Sejong Radiative Transfer through Raman and Rayleigh Scattering in Dusty Medium

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Emission features formed through Raman scattering with atomic hydrogen provide unique and crucial information to probe the distribution and kinematics of a thick neutral region illuminated by a strong far-ultraviolet radiation source. We introduce a new 3-dimensional Monte-Carlo code to describe the radiative transfer of line photons subject to Raman and Rayleigh scattering with atomic hydrogen. In our Sejong Radiative Transfer through Raman and Rayleigh Scattering (STaRS) code, the position, direction, wavelength, and polarization of each photon is traced until escape. The thick neutral scattering region is divided into multiple cells. Each cell is characterized by its velocity and density, which ensures flexibility of the code in analyzing Raman-scattered features formed in a neutral region with complicated kinematics and density distribution. We are continuously developing STaRS to adopt the absorption and scattering effect by dust. This presentation introduces STaRS and its current state and study.