disk galaxies having formed ~1.5 Gyr before our own solar system. Finally, we expect that ~ 1.4×10^9 planets similar to present-day Earth have existed so far in our galaxy.

성간물질

[포 IM-01] Looking for Direct Evidence of Triggered Star Formation: Gas Kinematics

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Stellar wind and radiation pressure from massive stars can trigger the formation of new generation of stars. The sequential age distribution of stars, the morphology of cometary globules, and bright-rimmed clouds have been accepted as evidence of triggered star formation. However, these characteristics do not necessarily suggest that new generation of stars are formed by the feedback of massive stars. In order to search for any physical connection between star forming events, we have initiated a study of gas and stellar kinematics in NGC 1893, where two prominent cometary nebulae are facing toward O-type stars. The spectra of gas and stars in optical and near-infrared (NIR) wavelength are obtained with Hectochelle on the 6.5m MMT and Immersion GRating INfrared Spectrograph on the 2.7m Harlan J. Smith Telescope at McDonald observatory. In this study, the radial velocity field of gas across the cluster is investigated using Hα and [N II] λ 6584 emission lines, and that of the cometary nebula Sim 130 is also probed using 1-0 S(1) transition line of H_2. We report a distinctive velocity field of the cometary nebulae and many ro-vibrational transitions of H_2 even at high energy levels in the NIR spectra. These properties indicate the interaction between the cometary nebulae and O-type stars, and this fact can be a clue to triggered star formation in NGC 1893.

[포 IM-02] Machine Learning Approach to Estimation of Stellar Atmospheric Parameters

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We present a machine learning approach to estimating stellar atmospheric parameters, effective temperature (Teff), surface gravity (log g), and metallicity ([Fe/H]) for stars observed during the course of the Sloan Digital Sky Survey (SDSS). For training a neural network, we randomly sampled the SDSS data with stellar parameters available from SEGUE Stellar Parameter Pipeline (SSPP) to cover the parameter space as wide as possible. We selected stars that are not included in the training sample as validation sample to determine the accuracy and precision of each parameter. We also divided the training and validation samples into four groups that cover signal-to-noise ratio (S/N) of 10-20, 20-30, 30-50, and over 50 to assess the effect of S/N on the parameter estimation. We find from the comparison of the network-driven parameters with the SSPP ones the range of the uncertainties of 73~123 K in Teff, 0.18~0.42 dex in log g, and 0.12~0.25 dex in [Fe/H], respectively, depending on the S/N range adopted. We conclude that these precisions are high enough to study the chemical and kinematic properties of the Galactic disk and halo stars, and we will attempt to apply this technique to Large Sky Area Multi-Object Fiber Spectroscopic Telescope (LAMOST), which plans to obtain about 8 million stellar spectra, in order to estimate stellar parameters.

[포 IM-03] SED modeling of the Class 0 protostar L1527 IRS

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We model the spectral energy distribution (SED) of the Class 0 protostar L1527 IRS using a dust continuum radiative transfer code RADMC-3D to study the initial condition of gravitational collapse. To constrain the envelope structure, we use the data obtained by Herschel /PACS, which covers the far-infrared regime (55 – 190 μm) where the SED of L1527 IRS peaks. According to our modeling, a more flattened density profile fits the far-infrared SED of L1527 IRS better than the density profile of a rotating and infalling envelope. Thus, we employ the density structure of a Bonnor-Ebert sphere, which consists of the inner flat-topped and the outer power-law regions and is

often used for describing the density structure of the youngest sources in the low mass star formation process. A Bonnor-Ebert sphere fits very well the observed SED at λ > 10 μm, suggesting that L1527 IRS might collapse from an unstable Bonnor-Ebert sphere rather than a singular isothermal sphere.

[포 IM-04] A dust continuum radiative transfer module

Seokho Lee & Jeong-Eun Lee
Kyung Hee University

We have developed a module for the dust continuum radiative transfer calculation as part of "Packages of Unified modeling for Radiative transfer, gas Energetics, and Chemistry (PUREC)". PUREC will be applied to interprete observations of protoplanetary disks. When a disk is under the hydrostatic equilibrium condition, the dust temperature and the vertical density structure should be calculated simultaneously. This module calculates the dust temperature by using the method of mean intensity (Lucy et al. 1999). In the very optically thick mid-palne, the Monte-carlo method is not efficient, thus, we apply "modified random walk" and "Partial Diffusion Approximation" to the module. The module has been verified by bechmark tests.

[포 IM-05] Self-Regulation of Star Formation Rates: an Equilibrium Vieww

Chang-Goo Kim and Eve C. Ostriker
Princeton University

In this talk, I will present a theoretical and numerical framework for self-regulation of the star formation rates (SFRs) in disk galaxies. The theory assumes (1) force balance between pressure support and the weight of the interstellar medum (ISM), (2) thermal balance between radiative cooling in the ISM and heating via FUV radiation from massive young stars, and (3) turbulent energy balance between dissipation in the ISM and driving by momentum injection of SNe. Numerical simulations show vigorous dynamics in the ISM at all times, but with proper temporal and spatial averages, all the expected balances hold. This leads to a scaling relation between mean SFRs and galactic gas and stellar properties, arising from the fundamental relationship between SFR surface density and the total midplane pressure.

[포 IM-06] Photometry of MIRIS Paschen-α blobs detected in Cepheus

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By comparing MIRIS Paschen-α (Paα) Galactic Plane Survey (MIPAPS) data with Anderson's H II region catalog (the most complete Galactic H II region catalog up to date), we confirmed Paα detections from ~50% of the H II region candidates in Cepheus (Galactic longitude from +96° to 116°). The detection of the hydrogen recombination line identifies these candidates as clear H II regions. If we extend this result to the whole plane, more than 1000 candidates are expected to be identified as H II regions. In this contribution, we present the results of quantitative estimations (brightness, size, etc.) for the Paα blobs detected in Cepheus. To obtain intensity of Paα emission line, we perform background and point spread function (PSF) matching between two filter images (line and continuum filters) as well as flux calibration.

[포 IM-07] Outburst signatures of Class I source, IRAS 16316-1540

Sung-Yong Yoon, Jeong-Eun Lee, Seokho Lee, Sunkyung Park
Kyung Hee University

We observed 10 Class I sources as part of the IGRINS (Immersion GRating INfrared Spectroscoph) Legacy Program, "IGRINS Survey of Protoplanetary Disks (PI: Jeong-Eun Lee)". Unlike other Class I sources, IRAS 16316-1540 shows broad absorption features in the near-infrared spectra (H and K bands). The broadened absorption features have been detected toward FU Orionis-type objects. Boxy or double-peaked absorption profiles can be produced by a Keplerian disk that has the hot mid-plane heated by a burst mass accretion. We could fit the broad absorption features of IRAS 16316-1540 with a K5 V template stellar spectrum convolved with a disk rotation profile of 45 km s-1. Therefore, rotationally broadened absorption features detected in this Class I source suggest that the episodic accretion process occurs from the early stage of star formation.

[포 IM-08] Statistical Analysis for Turbulence