counterparts of telluric CH_4 absorptions if proper Doppler shifts betwen Earth and these planetary objects are provided. We are also expecting low-resolution (R~300) infrared spectra of Jupiter from the upcoming observations by JUNO's infrared 2-5 μm spectrograph during the encounter with Jupiter approximately starting from July 4, 2016. Although the spectral resolution is not enough to resolve the 3-μm P, Q, R branch lines of CH4, the gross envelopes of the P, Q, R branches should yield information on rotational temperatures. The rotational temperatures are useful because theycan be regarded as local temperatures, as discussed by Kim et al. (2014). Since the 3-μm CH_4 emission is mostly formed at micro-bar pressure levels, the derived rotational temperatures represent the local temperatures near the hompause of Jupiter. We discuss possible sciences from the derived homopause temperatures in the auroral and non-auroral regions of Jupiter.

[구 SS-16] An interpretation of potential catastrophic collision at P/2010 A2

Yoonyoung Kim[1], Masateru Ishiguro[1], Tatsuhiro Michikami[2], Akiko M. Nakamura[3]
[1]Seoul National University, [2]Kinki University, [3]Kobe University

Solar System has evolved with numerous collisions among asteroids. Ancient catastrophic collisions of large parent bodies led the formation of asteroid families and relevant dustband structures up to the present day, and it would be interesting to address a question – "what happens if an asteroid collides with another asteroid?" Recent discoveries of "active asteroids" in the main-belt have attracted interest for their potential to witness a catastrophic collision in the current Solar System. So far, however, there is no direct evidence for catastrophic collision on active asteroids while several objects have been confirmed for other mechanisms (e.g., 596 Scheila for impact cratering, P/2013 R3 and P/2013 P5 for rotational breakup). The most potential candidate for catastrophic collision could be a sub-km active asteroid P/2010 A2, which is still controversial on its driving mechanism, but if confirmed, would have made P/2010 A2 the unique example of catastrophic collision on the current main asteroid belt. In this presentation, we revisit all of archival data of P/2010 A2 in a combination with our own observation using Subaru/Suprime-Cam on 2011 June, where we have a great benefit of a large orbital coverage. We found a grain size dependence of dust ejection velocity from P/2010 A2 (a power-law size distribution with an index of k~ -1/10), which is favorable to a catastrophic disruption scenario in agreement with laboratory impact experiments. At this conference, we plan to provide our understanding of the morphology of P/2010 A2 through a perspective of catastrophic collision.

성간물질

[구 IM-01] MIRIS Paschen-α Galactic Plane Survey: Comparison with the H II region catalog in Cepheus region

Il-Joong Kim[1], Jeonghyun Pyo[1], Woong-Seob Jeong[1], Won-Kee Park[1], Min Gyu Kim[1,2], Dukhang Lee[1], Bongkon Moon[1], Sung-Joon Park[1], Youngsik Park[1], Dae-Hee Lee[1], Wonyong Han[1]
[1]Korea Astronomy and Space Science Institute
[2]Seoul National University

MIRIS Paschen-α (Paα) Galactic Plane Survey (MIPAPS) presents the first whole Galactic plane (with the width of $-3^\circ < b < +3^\circ$) map for the Paα emission line. Many of Paα features were detected more brightly than the previous observed Hα features, and they coincide well with dense cloud regions. This means that newly detected Paα blobs can indicate massive star forming regions (H II regions) screened by foreground clouds around Galactic plane. Anderson et al. (2014) presented the most complete Galactic H II region catalog based on WISE 12 and 22 um data. Of the cataloged sources, only ~20% have measured radio recombination line (RRL) or Hα emission, and the rest are still candidate H II regions. At first, we compare the MIPAPS results with Anderson's H II region catalog for the Cepheus region (Galactic longitude from +96° to 116°). From this, we will investigate how much MIPAPS can supplement the catalog, and show MIPAPS scientific potential. After that, we plan to extend this work to the whole plane, and finally catalog MIRIS Paα blob sources for the whole Galactic plane.

[구 IM-02] A comparison study of approximate and Monte Carlo radiative transfer methods for late type galaxy models

Dukhang Lee[1,2], Maarten Baes[3], Kwang-il Seon[1,2]
[1]Korea Astronomy and Space Science Institute (KASI), Republic of Korea,

[2]Korea University of Science and Technology (UST), Republic of Korea,
[3]Department of Physics and Astronomy, Ghent University, Belgium

Two major radiative transfer (RT) techniques have been developted to model late-type galaxies: approximate RT and Monte Carlo (MC) RT. In the approximate RT, first proposed by Kylafis & Bahcall, only two terms of unscattered (direct) and single-scattered intensities are computed and higher-order multiple scattering components are approximated, saving computing time and cost compared to MC RT. However, the approximate RT can yield errors in regions where multiple scattering effect is significant. In order to examine how significant the errors of the approximate RT are, we compare results of the approximate RT with those of SKIRT, a state-of-the-art MC RT code, which is basically free from the approximation errors by fully incorporating all the multiple scattered intensities. In this study, we present quantitative errors in the approximate RT for late type galaxy models with various optical depths and inclination angles. We report that the approximate RT is not reliable if the central face-on optical depth is intermediate or high (τ_V > 3).

[구 IM-03] An Implementation of the Adaptive Ray Tracing Method in the Athena Code

Jeong-Gyu Kim[1], Woong-Tae Kim[1], & Eve C. Ostriker[2]
[1]Seoul National University, [2]Princeton University

The incorporation of radiation from massive stars is essential for modeling the dynamics and chemistry of star-forming clouds, yet it is a computationally demanding task for three-dimensional problems. We describe the implementation and tests of radiative transfer module due to point sources on a three-dimensional Cartesian grid in the Eulerian MHD code Athena. To solve the integral form of the radiation transfer equation, we adopt a widely-used long characteristics method with spatially adaptive ray tracing in which rays are split when sampling of cells becomes coarse. We use a completely asynchronous communication pattern between processors to accelerate transport of rays through a computational domain, a major source of performance bottleneck. The results of strong and weak scaling tests show that our code performs well with a large number of processors. We apply our radiation hydrodynamics code to some test problems involving dynamical expansion of HII regions.

[구 IM-04] Estimation of Fuel Rate on the Galactic Disk from High Velocity Cloud (HVC) Infall

Kwang Hyun Sung, Kyujin Kwak
Ulsan National Institute of Science and Technology (UNIST)

Continuous accretion of metal-poor gas can explain the discrepancy between the number of observed G-dwarfs and the number predicted by the “simple model” of galactic evolution. The maximum accretion rate estimated based upon approaching high velocity clouds (HVCs) can be up to ~0.4 $M_\odot \cdot yr^{-1}$ which is comparable with the accretion rate required by many chemical evolution models that is at least ~0.45 $M_\odot \cdot yr^{-1}$. However, it is not clear to what extent the exchange of gas between the disk and the cloud can occur when an HVC collides with the galactic disk. Therefore, we examined a series of HVC-Disk collision simulations using the FLASH 2.5 hydrodynamics simulation code. The outcomes of our simulations show that an HVC will more likely take away substances from the galactic disk rather than adding new material to the disk. We define this as an HVC having a “negative fuel rate”. Further results in our study also indicate that the process and amount of fuel rate change can have various forms depending on the density, radius and velocity of an approaching HVC. The simulations in our study covers HVCs with a neutral hydrogen volume density from 1.0×10^{-2} cm^{-3} to 41.0 cm^{-3}, radius of 200 pc to 1000 pc and velocity in the range between 40 $km \cdot s^{-1}$ and 100 $km \cdot s^{-1}$.

[구 IM-05] Formation of star cluster clumps in the strong tidal field with initial fractal distribution

So-Myoung Park[1], Simon P. Goodwin[2], Sungsoo S. Kim[1,3]
[1]School of Space Research, Kyung Hee University,
[2]Department of Physics and Astronomy, University of Sheffield,
[3]Department of Astronomy and Space Science, Kyung Hee University

산개 성단이 형성 되는 시기에 성단 내 별들이 가지는 공간 분포는 구대칭에서 상당히 멀 것으로 추정되며, 프랙