Infrared Dark Cloud Core MSXDC G53.11+00.05

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Outflows and jets from young stellar objects (YSOs) are prominent observational phenomena in star formation process. Indicating currently ongoing star formation and directly tracing mass accretion, they provide clues about the accretion processes and accretion history of YSOs. While outflows of low-mass YSOs are commonly observed and well studied, such studies for high-mass YSOs have been so far rather limited owing to their large distances and high visual extinction. Recently, we have found a number of molecular hydrogen (H2 1-0 S(1) at 2.12 micron) outflows in the long, filamentary infrared dark cloud (IRDC) G53.2 located at 1.7 kpc from UWISH2, the unbiased, narrow-band imaging survey centered at 2.12 micron using WFCAM/UKIRT. In IRDC G53.2 which is an active star-forming region with ~300 YSOs, H2 outflows are ubiquitously distributed around YSOs along dark filaments. In this study, we present the most prominent H2 outflow among them identified in one of the IRDC cores MSXDC G53.11+00.05. The outflow shows a remarkable bipolar morphology and has complex structures with several flows and knots. The outflow size of ~1 pc and H2 luminosity about ~1.2 Lsol as well as spectral energy distributions of the Class I YSOs at the center suggest that the outflow is likely associated with a high-mass YSO. We report the physical properties of H2 outflow and characteristics of central YSOs that show variability between several years using the H2 and [Fe II] images obtained from UWISH2, UWIFE and Subaru/IRCS+AO188 observations. Based on the results, we discuss the possible origin of the outflow and accretion processes in terms of massive star formation occurring in IRDC core.

[구 SF-04] SED MODELING FOR CLASS 0 PROTOSTAR L1527 IRS

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We model the Spectral Energy Distribution (SED) of Class 0 protostar L1527 IRS using a radiative transfer code RADMC-3D. In addition to the photometry data from literatures, we include the Herschel/PACS data which well covers the far-infrared SED peak of L1527 IRS, providing precise constraints to the density structure and other physical properties of its circumstellar envelope. Previously, Tobin et al. (2013) presented a dust continuum modeling results using a rotating and infalling envelope (Terebey and Shu, & Cassen 1984 ; TSC envelope), which originally describes a power-law density profile ($\rho \propto r-\alpha$) with the power-law index (α) of 1.5. However, we find that Herschel/PACS data are better fitted with a shallower power-law density profile. This smaller power-law might be attributed to a inner envelope. Thus, we fit the SED of L1527 IRS with a Bonnor-Ebert sphere, which is a combination of the inner flat-topped and the outer power-law (α =2) density profiles. This Bonnor-Ebert sphere is often used to explain the density profile of prestellar cores, which is considered the earliest stages of star formation. The well-fitted SED with a Bonnor-Ebert sphere suggests that L1527 IRS might have collapsed from a Bonnor-Ebert sphere rather than a singular isothermal sphere.

[박 SF-05] Water vapor in high-mass star-forming regions and PDRs: the Herschel/HIFI view

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Massive stars play a major role in the interstellar energy budget and the shaping of the galactic environment. The water molecule is thought to be a sensitive tracer of physical conditions and dynamics in star-forming regions because of its large abundance variations between hot and cold regions. Herschel/HIFI allows us to observe the multiple rotational transitions of H2O including the ground-state levels, and its isotopologues toward high-mass star-forming regions in different evolutionary stages. Photodissociation regions (PDRs) are also targeted to investigate the distribution of water and its chemistry. We present line profiles and maps of H2O using data from two guaranteed-time key programs “Water In Star-forming regions with Herschel” and “Herschel observations of EXtra-Ordinary Sources”. We analyze the temperature and density structures using LTE and non-LTE methods. We also estimate turbulent and expansion velocities, and abundance of water in the inner and outer envelopes using the 1D radiative transfer code. Around high-mass protostars we find H2O abundances of ~10-8-10-9 for the outer envelope and ~10-4-10-5 for the inner envelope, and expansion and turbulent velocities range from 1.0 km s-1 to 2.0 km s-1. The abundances and kinematic parameters of the sources do not show clear trends with evolutionary indicators. The Herschel/HIFI mapping observations of H2O toward the Orion Bar PDR show that H2O emission peaks between the shielded dense gas and the radicals position, in agreement with the theoretical and the observational PDR structure. The derived H2O abundance is ~10-7 and peaks at the depth of AV ~8 mag from the ionization front. Together with the low ortho-to-para ratio of H2O (~1) presented by Choi et al. (2014), our results show that the chemistry of water in the Orion Bar is dominated by photodesorption and photodissociation.

관측자료

[구 AT-01] IGRINS : 1st Year Operation & Future Plan

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After successful commissioning observations in 2014, Immersion Grating Infrared Spectrograph (IGRINS) has been conducting its normal scientific operations on the 2.7m Harlan J. Smith telescope at the McDonald Observatory and has been producing high spectral resolution near-infrared spectroscopic data in excellent quality. We will present the current status of the instrument and its software packages, and highlight initial scientific results. In particular, we will discuss possibilities of having IGRINS on larger telescopes.

[구 AT-02] Photometric Transformation from RGB Bayer Filter System to Johnson-Cousins BVR Filter System

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The RGB Bayer filter system consists of a mosaic of R, G, and B filters on the grid of the photo sensors which typical commercial DSLR (Digital Single Lens Reflex) cameras and CCD cameras are equipped with. Lot of unique astronomical data obtained using an RGB Bayer filter system are available, including transient objects, e.g. supernovae, variable stars, and solar system bodies. The utilization of such data in scientific research requires that reliable photometric transformation methods are available between the systems. In this work, we develop a series of equations to convert the observed magnitudes in the RGB Bayer filter system (RB, GB, and BB) into the Johnson-Cousins BVR filter system (BJ, VJ, and RC). The new transformation equations derive the calculated magnitudes in the Johnson-Cousins filters (BJcal, VJcal, and RCcal) as functions of RGB magnitudes and colors. The mean differences between the transformed magnitudes and original magnitudes, i.e. the residuals, are (BJ - BJcal) = 0.064 mag, (VJ - VJcal) = 0.041 mag, and (RC - RCcal) = 0.039 mag. The calculated Johnson-Cousins magnitudes from the transformation equations show a good linear correlation with the observed Johnson-Cousins magnitudes.

[구 AT-03] Measuring AGN Core-shift Effect by Extended KVN with Global Baselines

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