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 ($\rho \propto r\text{-}\alpha$) 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