

[7SF-01] Identification of L328-IRS as a Proto-Brown Dwarf

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Our understanding of how brown dwarfs form is limited by observational evidence. We report identification of a L328-IRS as a proto-brown dwarf embedded in an isolated dense molecular core. This source exhibits typical properties of a protostar, however, its luminosity ($\sim 0.05 L_{\odot}$) is far below than expected from the least massive protostar by the standard star formation theory. The most likely mass accretion rate ($\sim 2.4 \times 10^{-7} M_{\odot} \text{ yr}^{-1}$) inferred from its small bipolar outflow is an order of magnitude less than the canonical value for a protostar. The mass available in its envelope is less than $0.1 M_{\odot}$. These points suggest that L328-IRS will accrete the mass of a brown dwarf, but not that of a star. L328 is found to be fairly well isolated from other nearby clouds and seems to be forming three sub-cores simultaneously through a gravitational fragmentation process. Altogether with these, our direct detection of inward motions in L328 which harbors this proto-brown dwarf clearly supports the idea that a brown dwarf forms like a normal star.

[7SF-02] Outflow properties of 24 DIGIT embedded sources

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We present a study of outflows on 24 embedded young stellar objects (YSOs), which are selected from the sources of the Dust, Ice, and Gas in Time (DIGIT) Herschel key program. Molecular outflow activity, which is believed to have strong dependence on accretion process, is the most powerful in the early embedded phase of star formation and declines as the central protostars evolve to the main sequence stage. In order to study the relation between the CO outflow observed in low J transitions and the properties of protostars, we mapped the CO outflows of the selected targets in J = 1-0 and J = 2-1 lines with the 14-m TRAO telescope and the 6-m SRAO telescope, respectively. We estimate CO outflow momentum fluxes (F_{CO}) and compare with bolometric luminosity, L_{bol} , bolometric temperature, T_{bol} , and the FIR molecular line luminosities of CO, H₂O, OH and [O I], which were detected by the Herschel-PACS observations. We found that $F_{\text{CO } 1-0}$ is greater than $F_{\text{CO } 2-1}$, and the mean ratio is about 2. L1455-IRS3 and IRAM04191 have high F_{CO} in spite of low L_{bol} . The well known correlation between F_{CO} and L_{bol} is not very evident from all our samples. However, F_{CO} and L_{bol} show a rather strong correlation if L1455-IRS3 and IRAM04191 are excluded. F_{CO} shows little correlation with FIR line luminosities of individual species, while the total FIR line luminosity summed over CO, H₂O, OH, and [OI] lines seems to have some correlation. In addition, we report 22 GHz H₂O, and 44 GHz CH₃OH maser line detections in four sources out of the 24 YSOs.