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Resolved Gas Temperatures and 12C/13C ratios in SVS13A via CH3CN and CH313CN

Multiple systems are common in field stars and the frequency is found to be higher in early evolutionary stages. Thus, it is crucial to study young multiple systems during the embedded stages. In particular, the way material accretes from the large-scale envelope into the inner region and how this flow interacts with the system physically and chemically has not been well characterized to date. We conducted ALMA observations toward the protobinary SVS13A targeting CH3CN and CH313CN J=12-11 K-ladder line emission. We used local thermal equilibrium (LTE) radiative transfer models including dust absorption to fit the spectral features of the line emission from CH313CN and CH313CN, deriving their physical and chemical properties. We identified a possible infalling signature toward the bursting secondary source VLA4A, which may be fed by an infalling streamer from the large-scale envelope. The mechanical heating in the binary system, as well as the infalling shocked gas, are likely to play a role in the thermal structure of the protobinary system. By accumulating mass from the streamer, it is plausible that the system experienced a gravitationally unstable phase before the accretion outburst. Finally, the derived CH313CN/CH313CN ratio is lower than the canonical ratio in the ISM and varies between VLA4A and VLA4B.

Section

Star Formation

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