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Observations of spiral and streamer on a candidate proto-brown dwarf

Spirals and streamers are the hallmarks of mass accretion during the early stages of star formation. We present the first ALMA observations of a large-scale spiral and a streamer towards a very young brown dwarf candidate in its early formation stages. These observations provide a unique insight into the influence of external environment that results in asymmetric mass accretion via feeding filaments on to a candidate proto-brown dwarf. We have provided two possible theoretical scenarios to interpret the observations: (i) a pseudo-disk twisted by core rotation, and (ii) the collision of two low-mass dense cores. Both models support a gravitational infall scenario of brown dwarf formation, albeit with some fundamental differences. The first model argues for the presence of a strong magnetic field in brown dwarf formation while the second model suggests that a minimal magnetic field allows large-scale spirals and clumps to form far from the candidate proto-brown dwarf. We have also found evidence that the impact of the large-scale streamer has triggered warm carbon-chain chemistry and affected the chemical composition in the close vicinity of the candidate proto-brown dwarf.

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