Feeding a Protostar with 10,000 au Scale Streamers.

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Dense cores are the places where stars are formed within the supersonic Molecular Clouds. These dense regions (n~10^5 cc) are cold (T~10 K) and display subsonic levels of turbulence (Mach ~ 0.5), and represent the initial conditions for both star and disk formation. However, the influence of the parental core properties on the disk formation process is still not well constrained, and it is therefore crucial to study dense cores with interferometers to better understand the dense core and disk connection.

We present NOEMA observations of a Class 0 object, which has been suggested to present a disk under gravitational instability (GI) (asymmetrical features in ALMA high resolution dust continuum emission). Our new data reveal a previously unseen large scale (~10,000 au) streamer of fresh gas from the surrounding dene core down to the disk scales. This streamer is perpendicular to the outflow, and it contains material with subsonic levels of turbulence, and therefore unperturbed by the outflow. Based on the total mass in the streamer and the free-fall timescale, we estimate infall rates to the disk scales, which clearly show that accretion via streamer can be have an important role in the disk formation. Moreover, these results show that previously observed disk asymmetries could also be driven by large scale asymmetric flows instead of GI.

This result shows the power and importance of studying dense cores with interferometers to provide a complete and proper picture of star and disk formation.