

ALMA Observations of Infalling Gas Motion toward Keplerian Disks around Protostars

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Circumstellar disks exhibiting Keplerian rotation (so-called Keplerian disk) are ubiquitous around young stellar objects, and are considered to be the sites of planet formation. Understanding of formation mechanism of such Keplerian disks is one of the key issues in present astrophysics. In the presentation, we will show our ALMA cycle 0 results in millimeter molecular lines of three protostellar sources, L1489 IRS, TMC-1A, and L1527 IRS. The Keplerian disks around these protostars are clearly identified in the $C^{18}O$ (2–1) emission. In addition, we have observed that the ambient gas surrounding the disks is rotating and falling toward the disks. On the other hand, the SO (5_6-4_5) emission exhibits a linear velocity gradient along the disk major axes, which is distinct from the Keplerian rotation and the infalling motion, and could trace a ring-like region at the centrifugal radius where the infalling material falls onto the disks and becomes Keplerian rotating. Our ALMA results have revealed the infalling material feeding mass and angular momenta to the Keplerian disks in L1489 IRS, TMC-1A, and L1527 IRS, and suggest that Keplerian disks around protostars likely grow in size and spin up by accumulating angular momenta from infalling material with evolution.