P102a The Envelope-Disk-Outflow System in Massive Protostellar Source G339.88-1.26

Yichen Zhang (RIKEN), Jonathan Tan (Chalmers; U. Virginia), Nami Sakai (RIKEN), Kei Tanaka (U. Osaka; NAOJ), James De Buizer (NASA-SOFIA), Mengyao Liu (U. Virginia), Maria Beltrán (INAF), Kaitlin Kratter (U. Arizona), Diego Mardones (U. Chile), Guido Garay (U. Chile)

We present ALMA molecular line observations of the massive protostellar source G339.88-1.26. The observations reveal a highly collimated SiO jet extending from the 1.3 mm continuum source, which connects to a slightly wider but still highly collimated CO outflow. Rotational features perpendicular to the outflow axis are detected in various molecular emissions, including SiO, SO_2, H_2S, CH_3OH, and H_2CO emissions. Based on their spatial distributions and kinematics, we find that they trace different parts of the envelope-disk system. The SiO traces the disk and inner envelope in addition to the jet, the CH_3OH and H_2CO trace the infalling-rotating envelope outside of the disk, and the SO_2 and H_2S appear enhanced around the transition region between envelope and disk, i.e., the centrifugal barrier, as well as the outer part of the disk. Envelope kinematics are consistent with rotating-infalling motion, while those of the disk are consistent with Keplerian rotation. These results indicate that an ordered transition from an infalling-rotating envelope to a Keplerian disk through a centrifugal barrier, accompanied by change of chemical composition, is a valid description of this massive protostellar source. This implies that at least some massive stars form in a similar way as low-mass stars via Core Accretion.