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From Psuedodisk Formation in Magnetized Collapse to the Interplay with Multi-faced Outflow Phenomena

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A plethora of new enigmatic phenomena in the innermost parts of protostellar systems associated with jets and outflows have been revealed by ALMA and JWST. These jets and outflows, along with the streamers from their magnetically collapsing prenatal envelopes, are integral parts of the physical processes that assemble the systems. We review the characteristics of these enigmatic, powerful phenomena that constitute telltale signs of the underlying fundamental physics revealed by generations of radio and optical telescopes. The unprecedented revelation of the fine, nested kinematic and morphological structures is consistent with theoretically predicted features of magnetized bubbles blown by magnetized winds from the innermost regions and the pseudo-disks formed inside the large magnetically supported envelopes. The ubiquitous characteristics of the coupled nested velocity and emission components finds a natural explanation in the unique combination of jet–outflow–envelope systems. Tomographic projection of the morphological and kinematic structures naturally connect to high-angular resolution and high-sensitivity observations of the magnetically-interplayed inflow and outflow, enriched by chemical diversity.

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