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Observational Signatures of MRI-driven Turbulence in Protoplanetary Disks: Connecting Numerical Simulations with ALMA

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Protoplanetary disks play a key role in star and planet formation processes. Turbulence in these disks, which arises from the magnetorotational instability (MRI), not only causes accretion of mass onto the central star, but also sets the conditions for processes such as dust settling, planetesimal formation, and planet migration. However, the exact nature of this turbulence is still not very well constrained in these systems.

In this talk, I will describe new work, utilizing both state-of-the-art numerical simulations and high resolution radio observations, to directly link numerical predictions for the turbulent velocity structure of protoplanetary disks to observations by the Atacama Large Millimeter Array (ALMA). ALMA's unprecedented resolution will allow us to generate a three-dimensional view of disk turbulence by measuring the turbulent broadening component of molecular lines at different disk heights and radii. A direct comparison between the observed turbulence values and those obtained from simulations will strongly constrain our theoretical understanding of these disks and the conditions under which planetary systems develop.

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