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Title: Coevolution of dust and magnetic turbulence in protoplanetary disks: critical dependence on the net vertical magnetic flux

Abstract:

Turbulence driven by magnetorotational instability (MRI) affects planetesimal formation by inducing high-speed disruption and vertical diffusion of dust particles. In this talk, we examine conditions preferable for planetesimal formation in MRI-inactive dead zones on the basis of the results of our recent resistive MHD simulations. We show that successful planetesimal formation requires a sufficiently large dead zone (which can be produced by tiny dust grains) *and* a sufficiently weak net vertical magnetic flux (NVF). Although often ignored, the latter condition is indeed important since the strength of the NVF determines the saturation level of MRI-driven turbulence. We find that icy aggregates can grow beyond the meter-size fragmentation barrier when the NVF strength is lower than several mG. Formation of rocky planetesimals via the secular gravitational instability (secular GI) is also only possible with the NVF of similar strengths. Our results indicate that the fate of planet formation largely depends on how the NVF is transported in the initial disk formation and subsequent disk accretion processes.