P214b The Combined Influence of Turbulence and Disk Winds on Dust Distribution in Protoplanetary Disks

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We investigate the physical mechanisms required to suspend large, millimeter-sized dust grains at the significant vertical heights observed in protoplanetary disks. We develop an improved one-dimensional (1D) vertical structure model to calculate the equilibrium distribution of multi-sized dust grains under the combined influence of turbulent diffusion, characterized by the α-parameter, and frictional drag from disk winds. We also verified the applicability of the quasi-static assumption, confirming that it is sufficiently accurate for the primary particle sizes under investigation. Our work confirms that the combination of turbulence and disk winds is a core mechanism for shaping the vertical dust structure. Building on this foundation, we plan to extend our model to two dimensions (2D) to investigate the more complex coupling between the radial drift and vertical mixing of dust, thereby providing more precise initial conditions for theories of planet formation.