Abstract Submitted
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Dust Settling in Protoplanetary Disks with a Terminal Velocity Approach[1] JOSEPH BARRANCO, DIANA MADERA, San Francisco State University — It is a remarkable fact that planets start out as microscopic grains within protoplanetary disks of gas and dust in orbit around newly-formed protostars, somehow growing by a factor of 10^{40} in mass in a period no more than 10^7 years. In the early stages of the planet formation, small dust grains settle into the midplane of the disk in a few thousand years. As the dust layer gets thinner, a vertical shear develops between the dust-rich layer at the midplane and the dust-poor gas above and below. Of great interest is whether such a layer will be unstable to Kelvin-Helmholtz instability (KHI), which will remix the dust with the gas, thwarting the formation of planets. In our previous work, we worked in the single-fluid limit in which the local dust-to gas ratio was an advectively conserved quantity (valid when the dust-gas friction time is very short). Here, we present new simulation in which this assumption is relaxed with a terminal velocity approach that allows dust to slowly drift apart from the gas. We investigate under what conditions dust may settle into dense layers at the midplane or get concentrated inside coherent vortices. Can dust concentrate enough to trigger a gravitational instability and clump up to form planetesimals, the building blocks of planets?

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