

Planetary Accretion - From Dust to Protoplanets

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To date, most simulations of planet formation have considered a particular stage of growth: dust coagulation, the formation of planetesimals, runaway or oligarchic growth. However, these stages are likely to take place simultaneously in different regions of a protoplanetary disk, and even within a single region. Considering a wide range of sizes introduces potentially important feedback mechanisms that control the rate of planetesimal formation, fragment production from catastrophic collisions, the significance of pebble accretion dynamics, and the dust abundance which affects the disk temperature profile. Different regions of the disk interact strongly due to radial drift and turbulent diffusion of small objects, so it is important to include a large portion of the disk in calculations. Here I will describe a new model for planet formation that includes all these stages of growth and examines accretion across an entire disk. I will present initial results from the model and discuss the implications for planet formation in the Solar System and elsewhere.