

Formation of planetary systems by pebble accretion

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Observations of protoplanetary discs around young stars show that dust grains grow rapidly to mm-cm-sized pebbles. Thus pebbles can be considered fundamental building blocks of planets. Pebbles are concentrated in the turbulent gas flow to such high densities that planetesimals with characteristic sizes of 100 km form by the gravitational collapse of the overdense filaments. These planetesimals continue to grow to planetary systems by accretion of the remaining pebbles. I will present an overview of the theoretical framework for pebble accretion that has emerged in the past years and show how this solves several inconsistencies and time-scale problems in classical planet formation theory. Finally, I will show that the presence of mm-sized chondrules in primitive meteorites provides direct evidence that the pebble accretion process was the dominant contribution to the growth of asteroids and planetary embryos in the inner regions of the solar protoplanetary disc.