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惑星トラップとスーパーアース：質量ー半径図への示唆
Planet Traps and Super-Earths: Implications for the Mass-Radius Diagram

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The discovery of a large number of super-Earths both by the radial velocity and by the transit has enabled a careful investigation of their composition that can provide fundamental constraints on their formation mechanisms. We present a statistical analysis for the population of planets that grow by the core accretion process at planet traps where rapid type I migration is halted. Evolutional histories of forming and migrating planets in evolving gas disks are computed theoretically in this model. We show statistically that the minimum mass of planets formed at planet traps via the core accretion scenario is about 5 Earth masses. These low-mass planets formed in our model are regarded as failed gas giants that contain a negligible or low mass atmosphere. Our results therefore imply that the composition of super-Earths may change from solid materials to gaseous/icy ones at about 5 Earth masses. Using a latest empirical mass-radius relationship, this transition value of planetary mass roughly corresponds to the recent estimate inferred from the Kepler data.