

N-body Simulation of Planet Formation with the Effect of Fragmentation

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We carried out N-body simulations of planetesimal driven migration including the effects of gas drag, type-I migration and fragmentation. Kominami et al. (2016) showed that the planetesimal driven migration can still take place even if the self-gravity of the planetesimals are considered. They also showed that the random velocity increase of the planetesimals was crucial for the migration to continue or to halt. The random velocity of the planetesimals can be affected by the gas drisk and if the gas disk is considered, type-I migration of the protoplanet should be taken into account. Here we carried out N-body simulation that include the self-gravity of the planetesimals with the effect of gas drag, type-I migration and fragmentation. We show that the growth of the planetesimals in the perfect accretion cases prevents the outward planetesimal driven migration. If the fragmentation is considered, small planetesimals are produced, which enhance the outward planetesimal driven migration. We show some cases which outward planetesimal driven migration overcomes type-I migration.

Keywords: N-body simulation, fragmentation, type-I migration