GPU-accelerated High-resolution N-body Simulations for Planet Formation Toward 100 Million Particles

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We developed a fully-parallelized hybrid N-body code for planet formation (**PENTACLE**: Iwasawa et al., *submitted*), implementing the P^3T method (Oshino et al., 2011) and a multi-purpose platform for a parallelized particle-particle simulation (FDPS: Iwasawa et al., 2016) into it. PENTACLE enables us to handle up to ten million particles for N-body simulations in a collisional system, using a present-day supercomputer. Toward a high-resolution N-body simulation with 100 million particles and beyond, we are now developing a parallelized hybrid N-body code optimized for a NVIDIA-based GPU cluster. In this talk, we show the performance and capability of PENTACLE and results of terrestrial planet formation in a narrow ring containing one (and ten) million planetesimals. Then, we introduce the current status of our GPU-accelerated N-body code (**PENTAGLE**) and our future plans, for example, a global simulation of the delivery of water to the Earth in the protosolar nebula.

Keywords: Planet formation, N-body simulation, GPU