[JJ] Evening Poster | M (Multidisciplinary and Interdisciplinary) | M-GI General Geosciences, Information Geosciences & Simulations

# [M-GI28]Development of computational sciences on planetary formation, evolution and surface environment

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Wed. May 23, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)

Computer simulations have been recognized as one of the fundamental tools in understanding planetary formation, evolution and diversity of surface environment. However, is may be notified that the continuous development of computational abilities in recent years does not seem to be well utilized in improving numerical simulations in those fields; computational efficiency has been improved by 6 orders of magnitude compared from the early 90's, many of our simulations do not seem to catch up qualitatively and quantitatively such improvement. We propose here in this session to ask those who are interested in computational sciences of various fields not only of planetary formation and evolution but also of earth and planetary sciences in general to join. The aim is to discuss various scientific and technical aspects of our numerical simulations to improve our skills to fully utilize those development of computational resources that is realized or will be realized in near future as "K" to "post-K".

# [MGI28-P01]High-resolution Global N-body Simulation of Planet Formation with Fragmentation

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In the past N-body simulations, when the collision takes place, two colliding bodies merge and form one new body (perfect accretion assumption). This treatment has been incorporated not to increase the number of bodies. Increase of the bodies leads to long simulation time. If perfect accretion is assumed, as the planetsimals grow, the number of the bodies decreases. This assumption let us able to set the initial number of particles to be large. However, fragments affects the protoplanet's and planetesimals' random velocity due to their dynamical friction, and have significant effect onto the planet accretion stage. Hence, it is crucial to include the effect of fragmentation into the N-body simulation. When the fragmentation is included in the simulation, large numner of small fragments are produced. The gas drag damps the random velocity of the fragments or small planetesimals. Such small planetesimals with small random velocity may enhance the planetesimal driven migration (PDM). This PDM can carry the protoplanet toward the outer region of the disk. In such case, inward type-I migration may be overcome. In our study, the effect of gas (gas drag and type-I migration) and fragmentation are included in our large scale N-body simulation. By doing so, we investigate the migration of the protoplanet. As the result, when the fragmentation was included, the protoplanet was surrounded by small planetesimals with small random velocity. These small planetesimals helped the protoplanet move outward (due to PDM) in the disk more smoothly than in the cases only with large planetesimals. Here we present how the type-I migration is affected by the effect of PDM which is enhanced by the fragmentation.

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