[EE] Evening Poster | P (Space and Planetary Sciences) | P-PS Planetary Sciences

[P-PS03]Small Bodies in the Solar System: Current Understanding and Future Prospects

convener:Masateru Ishiguro(Department of Physics and Astronomy, Seoul National University), Taishi Nakamoto(Tokyo Institute of Technology), Masahiko Arakawa(神戸大学大学院理学研究科, 共同), Masanao Abe(Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency)
Wed. May 23, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)
In this session, we welcome presentations regarding small bodies in the Solar System from a variety of approaches (i.e., laboratory experiments, observations, explorations, theoretical modeling, and sample analyses). Especially this year, the Hayabusa2 spacecraft is about to rendezvous with its mission target (Ryugu, C-type asteroid), and ready to make remote-sensing observations for acquiring detailed information of the primordial body. Taking account of the situation, we aim to organize our current understanding of these primordial bodies and further discussing future prospects in this research field.

[PPS03-P23]Evolution of Cometary Dust Particles to the Orbit of the Earth: Particle Size, Shape, and Mutual Collisions

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Keywords:Interplanetary dust particles, dynamical evolution, size frequency distribution, dust ejection

In this study, we numerically investigated the orbital evolution of cometary dust particles, with special consideration of the initial size–frequency distribution (SFD) and different evolutionary tracks according to the
initial orbit and particle shape. We found that close encounters with planets (mostly Jupiter) are the dominating
factor determining the orbital evolution of dust particles. Therefore, the lifetimes of cometary dust particles
(∼250,000 yr) are shorter than the Poynting–Robertson lifetime, and only a small fraction of large cometary dust
particles can be transferred into orbits with small semimajor axis. The exceptions are dust particles from 2P/Encke
and, potentially, active asteroids that have little interaction with Jupiter. We also found that the effects of dust
shape, mass density, and SFD were not critical in the total mass supply rate to the interplanetary dust particle (IDP)
cloud complex when these quantities are confined by observations of zodiacal light brightness and SFD around the
Earth’s orbit. When we incorporate a population of fluffy aggregates discovered in the Earth’s stratosphere and the
coma of 67P/Churyumov–Gerasimenko within the initial ejection, the initial SFD measured at the comae of
comets (67P and 81P/Wild 2) can produce the observed SFD around the Earth’s orbit. Considering the above
effects, we derived the probability of mutual collisions among dust particles within the IDP cloud for the

first time
in a direct manner via numerical simulation and concluded that mutual collisions can mostly be ignored.