New Progress toward the Understanding of Small Solar System Bodies

Convener:*Masahiko Arakawa(Graduate School of Science, Kobe University), Taishi Nakamoto(Tokyo Institute of Technology), Sei-ichiro WATANABE(Division of Earth and Planetary Sciences, Graduate School of Science, Nagoya University), Masanao Abe(Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency), MASATERU ISHIGURO(Department of Physics and Astronomy, Seoul National University), Chair:Masahiko Arakawa(Graduate School of Science, Kobe University)

Mon. Apr 28, 2014 9:00 AM - 10:45 AM  503 (5F)

This session is aimed at setting up a forum to discuss how we can make progresses in our understanding of the solar system evolution with our hands on data. Presentations related to the science of the small bodies in the solar system (satellites, asteroids, comets, interplanetary dust particles, trans-Neptunian objects, and planetesimals) are invited. In addition to the extensive astronomical/remote-sensing observations and theoretical works, Hayabusa has brought us samples back from Itokawa (S-type asteroid) for unprecedentedly detailed analysis. The results of the Hayabusa sample initial analysis do prove that analysis of returned samples will play a key role in our future study of the solar system evolution. While the mission preparation of Hayabusa2, which is targeted at a more primordial asteroid than Itokawa (1999JU3, C-type), is being matured, expectation of building a new gateway to biology-flavored topics via organic material and aqueous alteration analysis is ramping up. In this session, after summarizing the cutting-edge results obtained by various studies, including the impact physics important for the asteroid evolution, we will discuss the future shape of the study of the solar system evolution.

10:30 AM - 10:45 AM

Cratering chronology models for the near-Earth asteroid 1999 JU3

3-min talk in an oral session

*Kosuke ANDO¹, Tomokatsu MOROTA¹, Seiji SUGITA², Rie HONDA³, Shingo KAMEDA⁴, Manabu YAMADA⁵, Chikatoshi HONDA⁶, Hidehiko SUZUKI⁴, Sei-ichiro WATANABE⁷ (¹.Graduate School of Environmental Studies, Nagoya University, 2.Department of Complexity Science and Engineering, Graduate School of Frontier Science, The University, 3.Department of information Science, Kochi University, 4.School of Science, Rikkyo University, 5.Planetary Exploration Research Center, Chiba Institute of Technology, 6.The University of Aizu, 7.Division of Earth and Planetary Sciences, Graduate School of Science, Nagoya University)

The Japanese asteroid explorer Hayabusa-2, that is scheduled for launch in 2014, will observe a near Earth C-type asteroid 1999 JU3 and will return to Earth with its samples. In this study, we model cratering and crater erasure processes on 1999 JU3 to provide an age estimate for 1999 JU3 based on high-resolution images that will be obtained by Hayabusa-2. The impact rate on 1999 JU3 is calculated from population models of main-belt asteroids (MBAs) and near-Earth asteroids (NEAs) and the average collision probabilities for the main belt and for NEAs. By converting the impactor size to the size of consequent crater based on crater scaling law and the average collision velocities for the main belt and for NEAs, the cratering rate on 1999 JU3 is calculated. For comparison, we use two population models of asteroids, two crater scaling laws and five conditions of surface of 1999JU3. In addition, two crater erasure processes, seismic shaking and saturation of craters, are considered in our model. As a result, our models indicate that age estimate of 1999 JU3 primary depends on crater scaling laws used and
assumptions of surface conditions of 1999 JU3 rather than population models of asteroids.