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[U-06_28AM1]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

[U06-P03_PG]Performances of Flight Model of NIRS3: the Near Infrared Spectrometer on Hayabusa-2

3-min talk in an oral session

*Takahiro IWATA[1], Kohei KITAZATO[2], Masanao ABE[1], Takehiko ARAI[1], Yusuke NAKAUCHI[3], Tomoki NAKAMURA[4], Takahiro HIROI[5], Moe MATSUOKA[4], Shuji MATSUURA[1], Masanobu OZAKI[1], Sei-ichiro WATANABE[6] (1.Institute of Space and Astronautical Science, JAXA, 2.University of Aizu, 3.Graduate University for Advanced Studies, 4.Tohoku University, 5.Brown University, 6.Nagoya University)

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NIRS3: the Near Infrared Spectrometer is one of the candidate scientific instruments which will be equipped on Hayabusa-2 mission. It aims to observe near infrared spectroscopy at the wave length band of 1.8-3.2 micrometer to detect specific molecular absorption lines, including the absorption by hydrated minerals at 3 micrometer, on the target C-type asteroid. The major purpose of NIRS3 is to observe the absorption bands of hydrated minerals in the 3 micrometer band on the candidate target C-type asteroid 1999JU3. C-type asteroids are thought to be mother celestial bodies of carbonaceous chondrites (C-chondrites). C-chondrites have been classified into sub-groups by their composition, organization, and isotope ratio of oxygen. The spectra of C-type asteroids have also been classified into sub-types by their inclination and the existence of absorption bands detected in ground observations. However, the relationship between the sub-groups of C-chondrites and the sub-types of C-type asteroids has not been clarified due to the effects of solar radiation and space weathering. Therefore, we will directly observe the surface of a C-type asteroid without the terrestrial atmospheric absorption in the 3 micrometer band using NIRS3. Detecting younger terrain by global mapping of the asteroid and the ejecta of new

crater by the Small Carry-on Impactor (SCI) will also provide the spectra of surface less affected by space weathering. To estimate the quantities of the hydrated minerals with accuracies of 1 to 2 wt%, we designed the NIRS3 system to have a signal-to-noise ratio (SNR) exceeding 50 at 2.6 micrometer for global mapping. The ground tests for NIRS3 flight model started in 2013. Results of the flight model tests implied that the dark current at the InAs sensor is much lower than that of the engineering model which improves SNR. The projected on-board SNR was confirmed to be sufficient during the one-year observation period of 1999JU3 assuming the asteroid surface temperature estimated from the heliocentric range and solar phase angle. The SNR exceeds 300 after 2.5 ms integration and 1024-stacking at the home position observations. The data obtained after the vibration tests and thermal-vacuum tests indicate that NIRS3 is sufficiently durable for the launching and on-orbit environments. The observed spectra for samples of serpentine, olivine, and C-chondrites (Murchison, Murray, and Jbilet Winselwan) demonstrated that the derived reflectances are almost the same as those obtained by Fourier-transform infra-red (FTIR) spectroscopy. These design results show that NIRS3 has sufficient performance for scientific objectives.