Hayabusa2 Multi-scale Asteroid Science

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The Japanese C-type asteroid sample return mission, Hayabusa2, was launched on December 3, 2014. The spacecraft is scheduled to arrive at the asteroid 162173 Ryugu on July 2018. During its 18-month stay, remote-sensing observations will be carried out by the on-board instruments, Optical Navigation Camera (ONC), Near Infrared Spectrometer (NIRS3), Thermal Infrared Imager (TIR), and Light Detection and Ranging (LIDAR). Based on the data from global mapping of the asteroid surface at 20 km in altitude, the three landing sites for collecting the asteroid samples will be determined. Furthermore, MASCOT, the small rover which packages a wide angle camera, a radiometer, a magnetometer and an infrared microscope, will acquire thermal inertia and chemical heterogeneities in a scale of centimeters to micrometers. It is therefore very important that the scientists from remote sensing, MASCOT, and sample analyses are mingled for sharing the common picture of the multi-scale science and that a discussion body is formed for integrating the observation results from the Hayabusa2 mothership and MASCOT. For this purpose, the international working group of multi-scale asteroid science has been newly organized. One of the tasks in the multi-scale asteroid science group is to work out a landing site selection strategy. Based on the scientific goal of Hayabusa2, we have targeted the region where water and organic compounds are abundant as the most scientific valuable site, which corresponds to primitive carbonaceous chondrites. For the characterization of surface materials of the asteroid, we created flow strategies using the three spectral parameters; i) 0.7 μm absorption features in reflectance spectra derived from hydrous minerals (i.e., serpentine), ii) 0.39 and/or 0.55 μm reflectance that are derived from albedo and organic carbon contents, iii) 3 μm absorption features derived from hydrated minerals, which enables the determination up to other five meteorite groups.

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