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Calibration of Asteroid Explorer Hayabusa-2 ONC (Optical Navigation Camera)

Masaki Sato[1*], TAKEI, Akito[1], Yuichiro Cho[2], Hidehiko Suzuki[1], Manabu Yamada[3], Shingo Kameda[1], Hayabusa2 ONC team[4]

[1]Rikkyo University, [2]The University of Tokyo, [3]Chiba Institute of Technology, [4]JAXA

The Asteroid Explorer Hayabusa succeeded in returning samples from the S-type asteroid Itokawa. Building upon the technology obtained by Hayabusa, its successor, Hayabusa-2, will visit the C-type asteroid 1999JU3.

One of the differences between S-type and C-type asteroids is the degree of thermal metamorphism present in the asteroid, with a lesser degree of metamorphism in C-type asteroids. From this perspective, a C-type asteroid is a more primitive body and is considered to contain more organic or hydrated minerals. Hayabusa-2 will retrieve samples from the surface of asteroid 1999JU3, which are predicted to be consistent of the non-advanced metamorphic nature of C-type asteroids.

Reflectance spectra of asteroid 1999JU3 were acquired from ground-based observations. These show an absorption feature centred near 700 nm that is commonly seen in hydrated minerals. However, it is possible that hydrated minerals are not distributed throughout the asteroid's surface. To select a suitable landing point, it is necessary to observe the presence or absence of absorption features centred near 700 nm even after the launch to identify areas containing hydrated minerals.

Observations for the landing point selection will be conducted using an Optical Navigation Camera (ONC). An ONC contains three cameras, ONC-W1, ONC-W2, and ONC-T. ONC-W1 and ONC-W2 are wide-angle cameras, and ONC-T is a telescopic camera. In ONC-T, there is a filter wheel, which consists of seven bandpass filters (390 nm, 480 nm, 550 nm, 589.5 nm, 700 nm, 860 nm, 950 nm) and a sheet of glass. Rotation of this filter wheel facilitates spectroscopic observations. A suitable landing point will be selected based on these observations.

In preparation for the optical calibration test of the flight model, we prepared the calibration camera and filter for the ONC. After calculating the luminance on the surface of 1999JU3 and measuring the filter transmittance, we conducted sensitivity calibrations, and flatness measurement and determined the point spread function (PSF) as preliminary experiment.

Based on these preliminary experiments, we conducted the optical calibration test of the flight model. This presentation will show the result of the preliminary experiments and the optical calibration test of the flight model.