Ground-based Experimental Simulations of Multi-Band Spectral Imaging by Hayabusa2.

*Keiichi Moroi[1], Shingo Kameda[1], Seiji Sugita[2]

1. Rikkyo University, 2. University of Tokyo

The Hayabusa2 spacecraft was launched in 2014 and is expected to arrive at the asteroid Ryugu, a C-type asteroid, in June 2018. One objective of the Hayabusa2 mission is to return with primordial samples from Ryugu. Using ground-based reflectance spectroscopy, Vilas (2008) detected 700 nm band absorption on Ryugu, indicating the presence of hydrous minerals. The Hayabusa2 spacecraft performs multi-band spectrum observation using a telescopic optical navigation camera (ONC-T) with seven bandpass filters, and specifies the point with 700-nm absorption feature for landing site selection. Therefore, it is important to confirm the detectability of 700 nm absorption from multi-band spectral observations.
Multi-band spectral imaging was performed using the ONC-T flight model on the carbonaceous chondrites having a similar reflectance spectrum as the C-type asteroid at the phase angle of 30˚ for light-source–sample–camera (Kameda et al., 2015). This result was averaged in 50 ×50 pixels, equal to the spatial resolution of 100 m for global observations from the Home Position (HP). In contrast, the Hayabusa2 projects will create a distribution map of hydrated minerals on the Ryugu surface with a spatial resolution of 30 m for HP observations. Therefore, the ONC-T is equipped with a wheel containing seven bandpass filters. When the filter wheel is rotated to change the bandpass filters, the field of view of the ONC-T at the Ryugu surface drifts due to asteroid spin, a phenomenon that previous research has not simulated.
In this study, we perform multi-band spectral imaging using a camera that simulates ONC-T at the phase angle of 30˚, and we confirm the detectability of 700 nm absorption with a spatial resolution of 30 m for HP observations, simulating field of view drift. Moreover, the phase angle of Sun-Ryugu–Hayabusa2 is expected to vary in the range from 0˚-40˚ while the Hayabusa2 spacecraft perform observations, and incident and emission angle are expected to vary due to inclines of the asteroid surface too. We also confirm the detectability of 700 nm absorption in such various cases.

Keywords: Hayabusa2, ONC-T, Hydrated minerals

