

Global distribution and spectral characteristics of bright spots on asteroid Ryugu

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On June 27, 2018, the asteroid explorer Hayabusa2 arrived at the target C-type asteroid 162173 Ryugu. The telescopic optical navigation camera (ONC-T) on-board Hayabusa2 has acquired the multiband image data for the entire surface of Ryugu with spatial resolutions better than 2 m/pixel. These data show that the Ryugu surface has the very low surface reflectance, flat spectra, and its spatial homogeneity [Sugita et al. 2019]. However, more detailed observations on Ryugu have revealed that many boulders exhibit different spectral properties and that a number of spots with distinctively brighter than the surroundings [Sugita et al. 2019]. Although larger boulders have been analyzed to show that they form two distinctive spectral trends, no substantial spectral analyses on bright spots have been conducted. Determining whether or not these bright spots are one of the materials that originate from the parent body of Ryugu is important to understand the differentiation and geologic processes on the parent body. In this study, in order to understand origins of the bright spots, we investigated spectral characteristics of the bright spots and compared those of the boulders on Ryugu. We used the ONC-T multiband images obtained in Box-A (20 km altitude) and mid-altitude (5 km altitude) operations.

We found seven meter-sized bright spots that have radiance factor 1.3 to 2.0 times higher than that of the surrounding area. The spectra of these bright spots were classified into two types, one being a flat spectrum type and another being a convex spectrum type. The former type has spectrum similar to but flatter and brighter than the mean spectra of the whole Ryugu and boulders, suggesting that the bright spots originate from parent body of Ryugu. The latter type has spectrum similar to those of S-type asteroids, suggesting their exogenous origin.

Keywords: asteroids, Ryugu, bright spot, spectrum, boulder