**THE SPECTROPHOTOMETRIC PROPERTIES OF RYUGU'S REGOLITH AS SEEN AT OPPOSITION BY THE NIRS3 ONBOARD HAYABUSA2.** D. Domingue[1], K. Kitazato[2], M. Matsuoka[3], E. Tatsumi[4,5], Y. Yokota[3], S. E. Schröder[6], R. Honda[7], S. Sugita[8], T. Hiroi[9], R. Brunetto[10], A. Barucci[11], F. Vilas[1], D. Takir[12], L. Le Corre[1], N. Moskovitz[13]. [1]Planetary Science Institute (domingue@psi.edu), [2]University of Aizu, Fukushima, Japan, [3]Institute of Space and Astronautical Sciences, Japan Aerospace Exploration Agency, Japan, [4]Instituto de Astrofisica de Canarias, Tenerife, Spain (etatsumi@iac.es), [5]Dept. of Astrophysics, Univ. of La Laguna, Tenerife, Spain, [6]DLR, Germany, [7]Kochi Univ., Japan, [8]Univ. of Tokyo, Japan, [9]Brown University Providence, USA, [10]Institut d'Astrophysique Spatiale, Orsay, France, [11]Observatoire de Paris, Paris, France, [12]Jacobs/NASA Johnson Space Center, Houston, TX, USA, [12]Lowell Observatory, Flagstaff, AZ, USA.

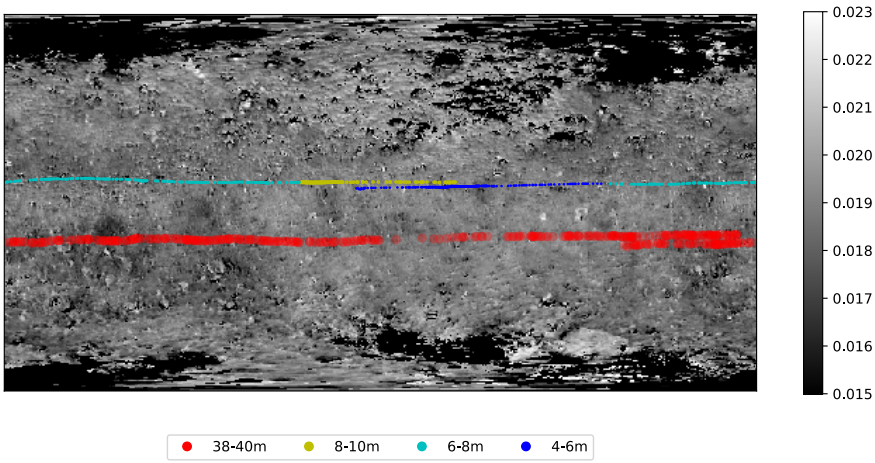


*Fig. 1. NIRS3 footprints of the spectral data used in this study are overlaid on the ONC-T V-band standardized reflectance map [1]. The circles are sized to the footprint resolution of the spectra with blue representing 4-6 m/pxl resolution, teal representing 6-8 m/pxl resolution, yellow representing 8-10 m/pxl resolution, and red representing 38-40 m/pxl resolution.*

The Near-Infrared Spectrometer (NIRS3) onboard the Hayabusa2 spacecraft obtained infrared spectra of C-type asteroid 162173 Ryugu near opposition (phase angles below 1 deg) at various spatial scales over the near-equatorial, low latitude regions (Fig 1). We examine the wavelength dependence of the opposition region, photometric modeling of the opposition data sets, and comparisons with the opposition measurements acquired by the Optical Navigation Camera (ONC).

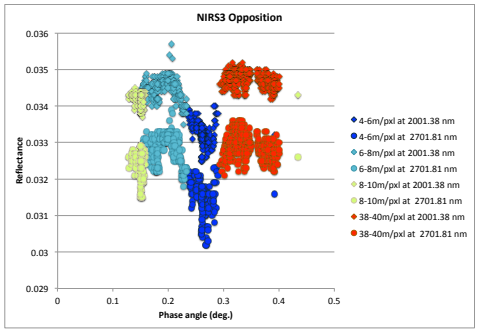


*Fig 2. NIRS3 opposition data at 2001.38 nm (diamonds) and 2701.81 nm (circles) within the various footprint resolutions.*

Examples of the reflectance variations seen with wavelength (and footprint resolution) are shown in Fig. 2. These observations suggest that the physical structure and roughness of Ryugu are constant over the size scales sampled by the different wavelengths, but that the grain size and porosity vary.

The NIRS3 data were modeled using the Hapke set of equations [2]. Preliminary results suggest that both the single particle scattering function and surface roughness parameters are nearly constant with wavelength. Variations with wavelength are seen in the single scattering albedo, the opposition amplitude, and the opposition width. Single scattering albedo variations mimic the spectral signature and the opposition parameters show variations centered about the 2.7 μm band.

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**References:** Tatsumi et al. 2020, submitted to Astronomy & Astrophysics. [2] Hapke (2012) Cambridge Univ. press.