PDC2023
Vienna, Austria

X NEO Characterization
X Space Mission & Campaign Design

Spectroscopic and photometric properties of (98943) 2001 CC21, the target of Hayabusa2# space mission

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Keywords: *near-Earth asteroids, (98943) 2001 CC21, Hayabusa2#, photometry, spectroscopy*

ABSTRACT

The Hayabusa2 spacecraft has completed the nominal mission operation of returning samples from the asteroid (162173) Ryugu. The near-Earth asteroid (98943) 2001 CC21 is the Hayabusa2 extended mission (nicknamed Hayabusa2#) flyby target during 2026 [1]. In this context, the observations performed with ground-based telescopes are a key science input for the scientific investigation of this object. They are also important for designing the engineering approach of spacecraft to this near-Earth object. The acquired data will contribute to the scientific results, allowing a direct comparison between ground-based telescopic observations and in-situ measurements obtained by the onboard instruments of Hayabusa2, the multi-band imager ONC-T and the near-infrared spectrometer.

The visible spectrum of 2001 CC21 was first reported in 2004 by [2]. On this first observation, the reflectance spectrum of asteroid was classified as a L-type (Bus taxonomy), which has a red slope and it is relatively flat around 1 μm. The L-type is a peculiar class of asteroids, and only 2% among all spectrally observed asteroids belong to it. During the same observational window, [3] reported a visible to near-infrared spectrum of this asteroid. Based on their spectral curve, they classified it as an Sk-type (Bus taxonomy), less red spectral slope and a stronger 1-μm absorption band characteristic of olivine-pyroxene compositions.

Our first observations of 2001 CC21 were made during February-March 2022 using the 1.5 m Carlos Sánchez telescope (TCS) at Tenerife, Spain equipped with the MuSCAT2 instrument which acquirers data in three broad band filters, g (400-500 nm), r (550-720 nm), and zs (820-900 nm). The average colors: (g-r) = 0.713 +/- 0.037 mag, (r-z) = 0.125 +/- 0.02 mag are compatible with an S-type asteroid. We also determined the B-V =1.142 mag, and V-R = 0.461 mag by using 2.5m Isaac Newton Telescope at La Palma, Spain. During this favorable observation window we

also obtain its light-curve. Our data confirms the rotation period in the order of 5.02 hrs (estimated by using the best fit) and it shows a light-curve amplitude of 0.85 +/- 0.1 mag. Our new observational attempt has been conducted by 10.4m Gran Telescopio Canarias (GTC) to obtain the visible spectra in December 2022. We will discuss the mineralogy of 2001 CC21 based on our ground-based observations.

A detailed characterization of the photometric and spectroscopic properties can be obtained during the beginning of 2023, when the asteroid will have an apparent magnitude of 16.5 and favorable geometry for observations. In this context we are running an observing campaign to characterize (98943) 2001 CC21. Our objectives are 1) to estimate the surface composition, 2) to characterize the space-weathering effects on its surface, 3) to check for possible large-scale inhomogeneity, 4) to find a possible correlation between the slope of the spectra and the phase angle, and 4) to determine its rotational properties. The observations will be performed using various telescopes from Observatorio del Roque de los Muchachos. During the talk we will present the preliminary results of these observations.

References:

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Comments: Oral

(Alternative session, Time slot, Oral or Poster, Etc…)