

GROUND-BASED OBSERVATIONAL CAMPAIGN FOR 162173 1999 JU3, THE TARGET ASTEROID OF SAMPLE RETURN MISSION, HAYABUSA-2. M. Abe¹, K. Kawakami², S. Hasegawa³, D. Kuroda⁴, M. Yoshikawa¹, T. Kasuga⁵, K. Kitazato⁶, Y. Sarugaku², D. Kinoshita⁷, S. Miyasaka⁸, S. Urakawa⁹, S. Okumura⁹, Y. Takagi¹⁰, N. Takato⁴, T. Fujiyoshi⁴, H. Terada⁴, T. Wada¹, Y. Ita⁴, F. Vilas¹¹, P. R. Weissman¹², Y.-J. Choi¹², S. Larson¹³, S. J. Bus⁵, A. Tokunaga⁵, T. G. Muller¹⁴, ¹Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency, 3-1-1 Yoshinodai, Sagami-hara, Kanagawa 229-8510, Japan (abe@planeta.sci.isas.jaxa.jp), ²The University of Tokyo, ³Japan Space Exploration Center, Japan Aerospace Exploration Agency, ⁴National Astronomical Observatory Japan, ⁵University of Hawaii, ⁶The University of Kobe, ⁷National Central University, ⁸Tokyo Metropolitan Government, ⁹Japan Spaceguard Association, ¹⁰Aichi Toho University, ¹¹MMT observatory, ¹²Jet Propulsion Laboratory, ¹³Lunar and Planetary Laboratory, ¹⁴Max Planck Institute.

Introduction: JAXA is planning the sample return mission, Hayabusa-2. 162173 1999JU3 is C-type asteroid which is one of the most accessible asteroids by spacecraft. It has been selected as a mission target.

1999JU3 was observable from 2007 summer to 2008 spring. There won't be any observation chance before 2012, so we need to know asteroid's rotation period, shape, and direction of rotation axis to draw up the mission.

Observation:

We performed observational campaign of this asteroid. We executed observations from May 2007 to March 2008 as following.

-Visible photometry & light curve data

Lulin 1m (13 nights), Kiso 1.05m (17 nights), Ishigaki 1m (10 nights), BSGC 1m (6 nights), UH 2.2m (1 night) and Steward 1.55m (4 nights)

-Near infrared photometry

CFHT3.6m/WIRCcam (Aug28-30 2007)

-Thermal infrared photometry

Japanese infrared space telescope, AKARI/IRC (May16 2007) and Subaru/COMICS (Aug27 2007)

-Visible spectroscopy

MMT 6.5m (July11, Sep8,9 2007)

-Near infrared spectroscopy

IRTF 3m (Sep18,20 2007)

Results:

We got new information of 162173 1999JU3 from this work.

-We confirmed that it is C-type asteroid from BVRI color indices and visible and near infrared spectroscopy. Reflectance spectrum was featureless as shown in Fig.1.

-Rotation period is $P=0.3178$ (± 0.0003) day, so probe vehicle can touch down on the surface. The lightcurve of 1999 JU3 phased against 0.3178 days is shown in Fig. 2. The amplitude of lightcurve is small, about 0.1 magnitudes.

-Rotation direction is a forward.

-The amplitude of lightcurve is always small from July 2007 to February 2008. This may indicate that axis ratio, a/b is almost 1.

-Diameter is 980 ± 29 m using NEATM [2] from observed flux, 15 and 24 micron by AKARI, 8.8, 9.7, 10.5, 11.7, 12.4 micron by Subaru. This is larger than Itokawa.

-Geometric albedo is 0.037 ± 0.002 that is typical value of C-type asteroids.

-Absolute magnitude H is 18.8 ± 0.027 and slope parameter, G is -0.11 ± 0.01 (Fig.3).

References: References: [1] Abe et al. (2007) LPS XXXVIII, Abstract #1638. [2] Harris (1998) Icarus 131, 291-301.

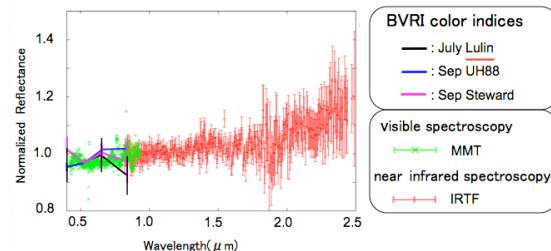


Fig.1. BVRI color indices and reflectance spectrum.

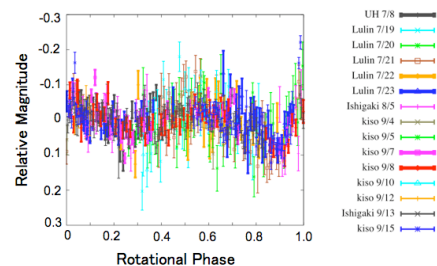


Fig.2. The lightcurve phased against 0.3178 days.

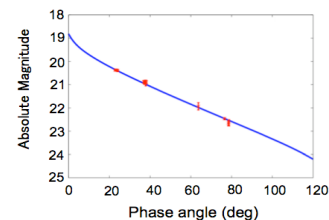


Fig.3. Absolute magnitude and slope parameter.