

Polarimetry of Near-Earth Asteroid (3200) Phaethon on 2017 December

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Asteroid (3200) Phaethon is one of the Near-Earth Asteroids with the orbital period of 1.43 yr. The asteroid was found a comet-like tail in multiple apparitions [1,2], and was classified as “active asteroid”. It is thought that Phaethon is the parent body of the Geminid meteor shower, which can be seen in middle of December every year, on the basis of its orbital parameters [3]. Because a meteor shower originates from dust particles ejected by a comet in general, Phaethon probably released a large amount of dust particles in the past. Although it is likely that Phaethon is a transitional object between comets and asteroids, little is known about the origins and materials of such transient objects. From these reasons, Phaethon’s flyby exploration is planned for the Destiny+ mission. Various information on Phaethon (such as shape model, rotational period and axis, properties of surface materials) are required until the mission. In order to study properties of surface materials of Phaethon, imaging polarimetric observations were carried out for 13 consecutive nights from 2017 December 9 through December 21. The linear polarization images of Phaethon were acquired with the Polarimetric Imager for COmet (PICO) [4] mounted on the Cassegrain focus of the 50 cm Telescope for Public Outreach at Mitaka Campus of National Astronomical Observatory of Japan, Tokyo, Japan [5]. We used the standard Johnson-Cousins R_C band filter [6] for all observations. PICO is double-beam type polarimeter, and the field of view was $\sim 13'$ by $6'$ on the sky for each image. The heliocentric and geocentric distances of Phaethon were 1.13 – 0.93 au and 0.07 – 0.11 au, respectively. We could take polarimetric data of Phaethon with very wide range of phase angle of 19.1° – 114.3° . We present the polarization curve and discuss properties of surface materials of Phaethon.

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