

DESTINY+: Phaethon flyby with reUSable probe

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Asteroid (3200) Phaethon is a parent body of the Geminids meteor shower. While most of the parent bodies of meteor showers are comets, cometary activity of Phaethon has only been reported near its perihelion at 0.14 AU. Phaethon is likely a comet to asteroid transitional body. Na depletion is reported from visible spectroscopic study of the ground observation of the Geminids meteoroid. Since an expected temperature by solar heating at 0.14 AU is not high enough to sublimate Na from Na-bearing phases, the observed Na depletion is likely derived from surface materials of the parent Phaethon. Na depletion does not occur in chondritic materials, but does occur in differentiated chondrites, such as primitive achondrites, which are subject to melting and segregation of Na-rich silicate melts. Phaethon may hold a signature of comet-asteroid transition body and primitive-differentiated material. Because of its small perihelion distance, dehydration of the surface material by solar heating is expected, but some primitive, hydrous material may still reside in its interior. Phaethon is an ideal body to understand on-going thermal evolution of primitive bodies in the solar system. Further, Phaethon is among the largest potentially hazardous asteroids (PHAs), of which cross the Earth's orbit. Thus, Phaethon is a critical mission target both in the context of science and planetary defense. Here, we present a flyby mission to Phaethon and its related asteroids by the DESTINY+mother ship and its daughter probe "PROCYON-mini", with their scientific significance.

Keywords: Asteroid (3200) Phaethon, Meteor Showers, Meteor shower parent bodies, Primitive bodies, DESTINY+, PROCYON-mini