

DESTINY+: FLYBY OF ASTEROID (3200) PHAETHON AND IN-SITU DUST ANALYSES.

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DESTINY+ (Demonstration and Experiment of Space Technology for INterplanetary voYage, Phaethon fLyby and dUst Science) was proposed for JAXA/ISAS small-class program in 2015 and was selected in 2017 [1]. It is currently in the pre-project phase (Phase-A) with a launch targeted for 2022. It is a joint mission of technology demonstration and scientific observation. It will test high performance electric propelled vehicle technology and high-speed flyby of asteroid (3200) Phaethon and possibly asteroid 2005UD, which is a likely break-up body from Phaethon [2] as an extended mission. Engineering challenges include an up-close encounter at a distance of 500 km from Phaethon with radio-optical hybrid navigation guidance and control, and autonomous imaging based on optical information for target tracking during a high-speed flyby of 33km/sec. The science goal is to understand the nature and origin of cosmic dust brought onto the Earth, in the context of exogenous contribution of carbon and organics for possible prebiotic seeds of the terrestrial life. Phaethon is a parent body of Geminid meteor shower, and thus a known source to periodically provide dust to the Earth, via the dust stream. Phaethon is a B-type, active asteroid which ejects dust only at the perihelion passage [e.g. 3,4]. The science objectives are: (1) in-situ analyses of velocity, arrival direction, mass and chemical composition of interplanetary and interstellar dust particles around 1 au, the dust trail, and nearby Phaethon, and (2) flyby imaging of Phaethon to study its geology, for understanding dust ejection mechanism of active asteroid and the surface compositional variation. Planned science observation is illustrated in Fig. 1. Phaethon approached the Earth as close as 10,000,000 km in December 2017. International observation campaign, including photometric, spectroscopic, polarimetric and radar observation were successfully conducted. These observation data are crucial to better characterize Phaethon for mission planning of DESTINY+.

References: [1] Arai T. et al. (2018) LPSC 49th, abstract#2570. [2] Ohtsuka K. et al. (2006) A&A 450, L25. [3] Jewitt D. and Li J. (2010) AJ, 140, 1519. [4] Jewitt D. et al. (2013) Astrophys. J. Lett. 771, L36.

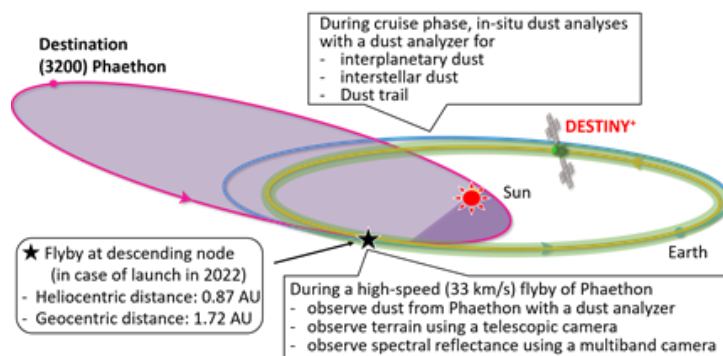


Fig. 1. Overview of DESTINY+ science observation.