

## Current status and science of DESTINY+

\*Tomoko Arai<sup>1</sup>, Masanori Kobayashi<sup>1</sup>, Ko Ishibashi<sup>1</sup>, Hiroshi Kimura<sup>1</sup>, Takayuki Hirai<sup>1</sup>, Peng Hong<sup>1</sup>, Fumi Yoshida<sup>2</sup>, Naoya Ozaki<sup>3</sup>, Takayuki Yamamoto<sup>3</sup>, Hiroyuki Toyota<sup>3</sup>, Kazutaka Nishiyama<sup>3</sup>, Hiroshi Imamura<sup>3</sup>, Takeshi Takashima<sup>3</sup>, DESTINY+ science team

1. Planetary Exploration Research Center, Chiba Institute of Technology, 2. University of Occupational and Environmental Health, Japan, 3. ISAS, JAXA

DESTINY+ (Demonstration and Experiment of Space Technology for INterplanetary voYage with Phaethon flyby and dUst Science) was selected in 2017 as a mission for JAXA/ISAS smallclass program. It will be launched in 2024 and fly by Phaethon in 2028. It is a joint mission of technology demonstration and scientific observation. The engineering mission is led by ISAS/JAXA and the science mission is led by PERC, Chiba Inst. of Technology (ChiTech). It will test high performance electric propelled vehicle technology and high-speed flyby of asteroid (3200) Phaethon and possibly asteroid 2005UD, a likely break-up body from Phaethon, 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 about 35km/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. The science objectives are two folded: (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. Science payloads include a panchromatic, telescopic camera with a tracking capability (TCAP), a visible-NIR multi-band camera with four bands of 425, 550, 500, 850 nm (MCAP), and a dust analyzer (DDA). While the two cameras are developed by PERC, Chitech, DDA is developed by Univ. of Stuttgart, as an international collaboration. Ground calibration for DDA is being performed with German/Japanese joint efforts. International observation campaign for Phaethon was conducted in December 2017, and that of asteroid 2005 UD in October, 2018. Also, international observation campaign for stellar occultation by Phaethon was performed in 2019. Here, we present the current status and science of DESTINY+ mission.

Keywords: DESTINY+, Phaethon, Geminid meteor shower, active asteroid, cosmic dust, Flyby