

Overview and current status of DESTINY⁺ mission

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DESTINY⁺ (Demonstration and Experiment of Space Technology for Interplanetary voyage, Phaethon flyby and dust Science) was selected in 2017 as a mission for JAXA/ISAS small-class program. 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 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 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. 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. High-spatial-resolution images of less than 5 meter per pixel are obtained with Telescopic camera (TCAP), and VIS-NIR spectral images of less than 100 meter per pixel are taken with multiband camera (MCAP). Mass, speed, arrival direction and chemical composition for each dust particle are analyzed with dust analyzer (DDA). Here, we present an overview and the current status of DESTINY⁺ mission.

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