The current status of the DESTINY^{+} mission: Flyby of Geminids parent (3200) Phaethon

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DESTINY^{+} (Demonstration and Experiment of Space Technology for INterplanetary voYage, Phaethon fLyby and dUst Science) is a mission proposed for JAXA/ISAS Epsilon class small program, currently in the pre-project phase (Phase-A) with a launch targeted for 2022. DESTINY^{+} is a joint mission of technology demonstration and scientific observation. DESTINY^{+} will conduct a high-speed (33 km/sec), close flyby of asteroid (3200) Phaethon with a radio-optical hybrid navigation guidance and control for high-resolution imaging.

The science goal is to understand the nature and origin of cosmic dust brought to the Earth, in the context of exogenous contribution of organics to the origin of terrestrial life. Cosmic dust particles are considered to be major carriers of organic matters to the Earth and be potential precursors to the origin of terrestrial life. They are derived either from cosmic dust background or from meteor showers. The former consists mostly of interplanetary dust derived from miscellaneous comets and asteroids, with minor interstellar dust. The latter are meteoroids transported via dust streams originated from known sources, i.e. comets and asteroids whose orbit cross the Earth’ s orbit. Phaethon is a parent of Geminid meteor shower. While most parent bodies of meteor showers are comets, Phaethon is an “active” asteroid with recurrent dust ejection around its perihelion (0.14 au). Phaethon is of scientific significance because it is a known carbonaceous active asteroid providing dust to the Earth, and is among the largest potentially hazardous body.
The science mission objectives are two folded: (1) to measure physical properties (velocity, orbit, mass) and chemical composition of dust around 1 au, and (2) to conduct geological observation of Phaethon upon flyby and analyze dust nearby Phaethon. The science observation is conducted with a panchromatic telescopic camera (TCAP), a Visible-NIR multiband camera (MCAP) and a dust analyzer (DDA).

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