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Dust Astronomy with DESTINY PLUS at 1 AU

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The mission DESTINY+ is an upcoming deep space mission of the Japanese space agency JAXA. The mission objectives of Destiny+ (Demonstration and Experiment of Space Technology for INterplanetary voYage for Phaethon fLyby and dUSt analysis) focus on technology demonstration that are key for future deep space exploration. The launch is planned for 2022 with a close flyby of the active asteroid 3200/Phaethon in 2026. A major part of the scientific payload is the German instrument Destiny+ Dust Analyzer (DDA).
During the cruise phase and before arriving at Phaethon, DDA will characterize the interplanetary and interstellar dust environment at solar distances between 0.75 and 1.0 AU. The mission results will shed new light on the interaction between the heliosphere and the interstellar dust particles as a component of the interstellar medium. How homogeneous is interstellar dust in its composition at 1 AU? What is the mass distribution and density of interstellar grains? Which organic compounds are found in interplanetary and interstellar dust particles? Answers are expected from the dust telescope DDA which consists of a dust trajectory sensor and a mass spectrometer for compositional analysis of individual dust impacts. This instrument measures the mass, composition, charge and velocity vector of micron-sized dust impacts. During the fast Phaethon encounter DESTINY+ will perform remote sensing and in-situ observations. A multi-band camera will track the small body environment and the new dust telescope DDA performs compositional analysis of micron-sized dust grains in the vicinity of Phaethon. The close observations of Phaethon as a rock-comet type object are essential to resolve questions related to the evolution of our inner Solar System, especially the heating process of small bodies. Phaethon is believed to be the parent body of the Geminids meteor shower and it is considered to be a comet-asteroid transition object. Such objects play a major role for recent mass accretion to Earth.