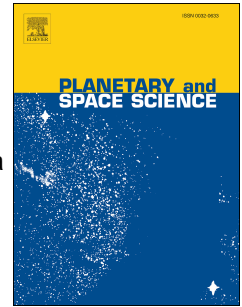


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In situ observations of dust particles in Martian dust belts using a large-sensitive-area dust sensor

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Abstract

In order to determine whether Martian dust belts (ring or torus) actually exist and, if so, to determine the characteristics of the dust, we propose a Circum-Martian Dust Monitor (CMDM) to be deployed on the Martian Moons Exploration (MMX) project, in which JAXA plans to launch the spacecraft in 2024, investigate Phobos and Deimos, and return samples back to Earth. The CMDM is a newly developed instrument that is an impact dust detector. It weighs only 650 g and has a sensor aperture area of ~ 1 m², according to the conceptual design study. Detectable velocities (v) range from 0.5 km/s to more than 70 km/s, which will cover all possible dust particles: circummartian (low v), interplanetary (mid v), and interstellar (high v) particles. The measurable mass ranges from 1.3×10^{-9} g to 7.8×10^{-7} g at $v = 0.5$ km/s. Since the MMX spacecraft will take a quasi-circular, prograde orbit around Mars, the CMDM will be able to investigate particles from Phobos and Deimos with relative velocities lower than 1 km/s. Therefore, the CMDM will be able to determine whether or not a confined dust ring exists along Phobos' orbit and whether an extended dust torus exists along Deimos' orbit. It may also be able to clarify whether or not any such ring or

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