火星衛星探査計画(MMX)搭載提案機器：分離カメラシステム5（DCAM5）
Deployable Camera system 5 (DCAM5) proposed for Martian Moon Exploration mission (MMX)

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We propose Deployable Camera system 5 (DCAM5) for remote and in situ observations of Phobos and Diemos in Martian Moon Exploration mission (MMX) led by JAXA. DCAM5 is the latest version of the DCAM series in space missions (DCAM1 and 2 were successfully operated in IKAROS mission and DCAM3 is equipped on Hayabusa2 mission). In this mission MMX, DCAM, a small handy-sized body equipped with several visible cameras, a triaxial accelerometer, batteries, and a communication unit will be separated from the spacecraft (SC) and thrown toward scientifically valuable regions of Phobos and Diemos where SC cannot approach nor land on, e.g., inner wall of Stickney crater.

As falling toward a target region, DCAM will take multiscale, multiband images of the target regions with a multiband camera equipped on the leading edge of DCAM. Multiband images with high resolutions down to ~ 1 cm/pix will reveal spectroscopic characteristics of the target region, such as the distribution of hydrated minerals and the texture of boulders which could reflect the thermal evolution of Phobos and Deimos. When DCAM collides to Phobos surface, we will measure the acceleration profiles at collision as an indicator of the mechanical properties of the landing point. From the acceleration profiles we will obtain the following properties depending on the nature of the landing point: (1) in the case of landing on a boulder, disruptive strength of boulders, which allows us to estimate Q* value reflecting the thermal evolution of Phobos, (2) in the case of landing on a regolith layer, penetration resistance (drag coefficient) of regolith layers which allow us to constrain the surface evolution inherent to Martian moons, and (3) in the case of a fine powder layer, compression curves of powder layers which reflects the porosity and the cohesion of the layer, constraining the levitation process on small bodies and the compression evolution of fluffly bodies such as planetesimals. After landing of DCAM, we will take close-up images of the surface to clarify the size and the porosity of the surface regolith.

Since DCAM is a light and small body, several DCAMs are preferred to be equipped and thrown toward different, valuable regions to reveal the origin and the evolution of Phobos and Deimos. Furthermore, we propose two objectives of DCAM5 other than the described above: one is to investigate candidate landing points on Phobos before landing of SC and the other is to observe the status of SC at around its landing and the disturbance of the landing points. Since each objective is achieved with one or more DCAMs, we need 3 DCAMs at least in order to complete all the objectives.

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