

Development of Lunar Impact Flash Observing Camera "DELPHINUS" on deep-space 6U spacecraft "EQUULEUS"

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EQUULEUS (EQUilibriUm Lunar-Earth point 6U Spacecraft) will be the world's smallest spacecraft to explore the Earth-Moon Lagrange2 point (EML2). The spacecraft will be jointly developed by the University of Tokyo and JAXA which will be launched by NASA's SLS (Space Launch System) EM-1 (Exploration Mission-1) in 2018. The spacecraft will fly to a libration orbit around the EML2 point and demonstrate trajectory control techniques within the Sun-Earth-Moon region.

DELPHINUS (DEtection camera for Lunar impact PHenomena IN 6U Spacecraft) is one of the onboard scientific instruments onboard EQUULEUS to observe meteoroids by using imaging of lunar impact flashes and near-Earth asteroids. Meteoroid are a small rocky bodies traveling through interplanetary space. When a meteoroid impacts the moon at several 10s of km/s, a brilliant flash at the point of impact can be observed as a lunar impact flash. The influx rate of interplanetary dusts onto the Earth-Moon surface are essential for understanding solar system evolution and are useful information for the future human space activities in the Cis-Lunar space that is the volume within the Moon's orbit. Thus, it is very important to investigate size distributions, influx rate and daily variation of meteoroids. Ground-based meteor observations by using all-sky cameras are limited to the roughly 10,000 km² of upper-atmosphere visible from their location. On the other, Lunar impact monitoring enables to monitor the more than 10⁶ km² collecting area. Lunar impact monitoring has a great advantage to detect large meteoroids in the mass range between 10s of grams and few kilograms corresponding to centimeters and tens of centimeters, which is as a bridge between small asteroids, larger than few meters size, and meteors, smaller than millimeter size, observed mainly from the ground.

This paper describes newly developed DELPHINUS camera system.

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