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

*Shinsuke Abe¹, Masahisa Yanagisawa², Hajime Yano⁴, Ryu Funase³

1. Nihon University, 2. The University of Electro-Communications, 3. The University of Tokyo, Japan, 4. JAXA

**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 $10^6$ 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.

Keywords: CubeSat, Lunar Impact Flash, Meteoroids, Meteors, Asteroids
DEtection camera for Lunar impact PHenomena IN 6U Spacecraft

DELPHINUS

Nikon University, University of Electro-Communications, University of Tokyo, JAXA COSINA Co., Ltd., WATEC CO., LTD., Imagetech Co., Ltd.