Geophysical Research Abstracts
Vol. 13, EGU2011-13549-1, 2011
EGU General Assembly 2011

Lightning and thundercloud observation in Jupiter using spacecraft and ground-based telescope

Yukihiro Takahashi (1), Mitsuteru Sato (1), Tetsuya Fukuhara (1), Makoto Watanabe (1), Yoav Yair (2), Karen Aplin (3), and Georg Fischer (4)

(1) Hokkaido University, Graduate School of Science, Department of Cosmosciences, Sapporo, Japan (spriteselves@gmail.com), (2) Open University, ISRAEL, (3) Oxford University, UNITED KINGDOM, (4) Space Research Institute, Austrian Academy of Sciences, AUSTRIA

Lightning process is an excellent tool to explore the planetary atmosphere as well as Earth based on the knowledge of the relationship between the atmospheric dynamics and electrical charge. It has been suggested for a decade that thunderstorms in Jupiter's atmosphere take important roles not only in the investigation of meteorology, which determines the large scale structures such as belt/zone and big ovals, but also in probing the water abundance of the deep atmosphere, which is crucial to constrain the behavior of volatiles in early solar system. We plan to make observation of thunderstorm activity based on lightning flash detection and cloud imagery using spacecraft and ground-based telescope. We propose a very simple high-speed imaging unit onboard Jovian orbiter of EJSM, Optical Lightning Detector, OLD, optimized for detecting optical emissions from lightning discharge in Jupiter. OLD consists of radiation-tolerant CMOS sensors and two H Balmer Alpha line (656.3nm) filters. In normal sampling mode the frame intervals is 29ms with a full frame format of 512x512 pixels and in high-speed sampling mode the interval could be reduced down to 0.1ms by concentrating a limited area of 30x30 pixels. Weight, size and power consumption are about 1kg, 16x7x5.5 cm (sensor) and 16x12x4 cm (circuit), and 4W, respectively, though they can be reduced according to the spacecraft resources. On the other hand, we also plan to try to detect the optical flashes using a ground-based 1.6 m reflector, which was installed this year by Hokkaido University. Here we introduce an strategy to observe lightning optical emissions by this telescope with narrow-band high speed imaging unit. Continuous monitoring with such a ground-based facilities enables us to compare lightning activity with variations of large-scale motions, leading to the understanding of the dynamics of Jovian atmosphere.