

Lightning and TLEs Observation by 50-kg Micro-satellite RISING-2

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RISING-2 satellite is under development by Hokkaido University, responsible for science instrument, and Tohoku University, responsible for BUS, in Japan, which is expected to be launched in a couple of years. The dimension and the total weight of the satellite are about 50 cm cubic and about 50 kg, respectively. One of the main scientific objectives of this micro-satellite mission is to monitor the global activity of lightning discharges and to identify the generation mechanisms of TLEs by investigating their horizontal structures. Lightning and Sprite Imager- 1 and 2 (LSI-1 and 2) are CMOS cameras with 512 x 512 pixels, which is directed nadir to take images of the horizontal distribution of sprite elements and area of lightning flash. In order to detect lightning emissions, we put a broadband filter between 740 and 830 nm on LSI-1. We install a rather narrow band- pass filter centered at 762 nm on LIS-2. The optics and the detector array altogether yield an effective field of view (FOV) of 35 deg, giving the pixel resolution of less than 660 m from the altitude of 660 km. Wide Field CCD imager (WFC) is a CCD camera with 659 x 494 pixels and the pixel size of 7.4 μ m, which will determine the location of lightning discharge flashes making use of wide horizontal coverage. WFC is looking at nadir direction and is equipped fish-eye lens to cover the whole visible disk of the earth. The outputs of these cameras are digitized by 10 bit A/D conversion. Furthermore, RISING-2 will carry a bolometer array camera (BOL) to image the horizontal temperature distribution that corresponds to the altitude of the cloud top, especially dedicated to the investigation of thundercloud's 3-D structure. This satellite also has a VLF receiver (VLFR) provided by Stanford University, which measures VLF radio wave radiations from lightning discharges.