

Lightning and sprite measurements from ISS

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Lightning and sprite measurement sensors on the International Space Station (ISS) are introduced in this presentation. These sensors consist of two optical imagers at two different frequencies, photo meters, spectroscopic sensor, and the VHF antennas to detect, locate and identify the lightning process which produces sprites. Our goals are 1) to detect and locate lightning and sprite within storm scale resolution over a large region of the Earth's surface along the orbital track of the ISS without any bias, 2) to clarify the sources of the sprite, and 3) to identify the sources of the terrestrial gamma ray flash (TGFs).

1) Global sprite and lightning measurement

In this mission, we measure the transient optical events in the night time and the electro-magnetic impulse from the VHF interferometer. Through these observations, the global distribution and its changes of sprite and lightning are measured. Based on these global distributions, the way how the sprite occurrences affect the global chemical composition can be evaluated and discussed.

2) Connection between the horizontal extent of sprite and lightning

In this measurement, two CMOS cameras and two photometers at two different wavelength have the nadir looking observations of lightning and sprite. In addition to this, VHF interferometric measurement of lightning is firstly conducted. Through these observations, we clarify the physical connection between the lightning process and the horizontal structure of sprite, and then to identify how the lightning channel determine the occurrence and structure of sprite.

3) Spectroscopic measurement of sprite in near ultra-violet wavelength

In our mission, we put a GRISM sensor to measure the near ultra-violet emission in 1 ms resolution. The N2P and N2+1N band spectral characteristics are exploited precisely for the first time, which enables us to specify the energy of the electrons to produce sprite and then to clear the mechanism of electron acceleration.

4) Connection between the TGFs and lightning

In this mission, optical and electro-magnetic measurements of lightning are conducted together with Gamma ray detector which will be on board on the Columbus module from ESA. Both sensors are going to be operated in a coordinated manner in terms of timing. With these co-incident data sets, we can reveal the sources of the TGFs and obtain the relationship between the TGFs occurrences and its origin.