

Relationships between the parameters which characterize Elves observed by ROCSAT-2 / ISUAL, and VLF sferics

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Elves are one of the optical phenomena caused by lightning discharge. It is reported that lateral scale of Elves is ~300-600km. Furthermore, time delay of the emission from lightning and the emission duration are ~350 micro-sec and shorter than 1ms, respectively.

Mechanism of Elves is that electromagnetic pulse from lightning discharge causes electron heating. Therefore, we think that there are relations between EMP intensity and parameters, such as emission intensity and diameter of Elves, and electron energy. But these relations have not been showed yet. Because optical luminosities and spectrum are distorted by atmospheric attenuation when observing from the ground. Consequently ROCSAT-2 satellite launched on May 2004 is much helpful in this point, enabling us to obtain optical luminosities and spectrum of Elves correctly by observing it from the space.

ISUAL (Imager of Sprites / Upper Atmospheric Lightning) instrument on board the ROCSAT-2 satellite is composed of an imager, a spectrophotometer (SP), and an array photometer (AP). Field of views of imager and SP are 20 deg. (horizontal) by 5 deg. (vertical). And that of AP is 22 deg. (horizontal) by 3.6 deg. (vertical). AP is composed of two photometers with blue (360-470nm) and red (520-750nm) filters, and both photometers have 16 spatial resolution vertically. We observe VLF sferics waveform at Sendai (38.15N, 140.50E) and Yamanashi (35.40N, 138.35E), Japan, using vertical dipole antenna for electric field and orthogonal loop antennas for magnetic field.

We calculate diameters of Elves using imager data, and emission intensities using AP data. Besides we can estimate the electron energy from the ratio of AP red and blue filters.

We will discuss relationships between the parameters which characterize Elves observed by ROCSAT-2 / ISUAL, and VLF sferics.