AEM002-06   Room:201A   Time:May 27 09:45-10:00

High-speed imagery of elves from airplane

Yuuna Shima[1]*, Yukihiro Takahashi[1], NHK's project"Beach of the Cosmos"[2]

[1]Dept. Cosmosciences, Hokkaido University, [2]NHK

NHK's project"Beach of the Cosmos"

Elves are a kind of Transient Luminous Events (TLEs), which are optical events occurring in middle atmosphere and at lower ionospheric altitudes, and they are directly related to the electrical activity in underlying thunderstorm. Elves are occurring at an altitude of ˜90 km, can spread ˜300-600 km laterally and shape like a doughnut. In addition, the luminous duration at a certain point is ˜0.1 ms and the emission spread throughout within ˜2 ms with phase velocity which is faster than the velocity of light. The luminous duration of elves is extremely short.

The temporal and spatial emission variation of Elves have observed using multi -anode photometer arrayed in a vertical direction [Fukunishi et al., 1996], and using photometer arrayed in a broadband horizontal direction [Barrington-Leigh et al., 2001]. However, there was no two-dimensional image of Elves structural variation.

In full cooperation with NHK, we succeeded in capturing the first image using high-speed camera from jet airplane flown at an altitude of ˜13 km. The camera was installed on a window of airplane and trained on horizontally to the travelling direction. We used panchromatic camera, and frame rate is ˜8000 fps.

In November 28th, 2010, there were lightning swarm activities ˜400 km out at sea of Chiba prefecture from ˜18:00 and the data are images of elves which are that lightning induced. On the day, the airplane took off heading out to sea of Kanto at ˜20:30 and captured images from 21:48 to 22:45. We captured 21 TLEs for an hour and confirmed that at least 3 events of them are elves in initial analysis.

We investigate the relation between temporal and spatial variation of Elves structure and characteristics of parent lightning.