

## Relationships between elves observed by the FORMOSAT-2 / ISUAL and their parent lightning discharges

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Elves are optical flashes in the lower ionosphere caused by electromagnetic pulses radiated from lightning discharges. It is reported that the lateral scale of elves is ~300-600 km and the duration of optical emission is smaller than 2 ms.

The ISUAL instrument on board the FORMOSAT-2 satellite observed more than 2000 elve events for the period from July 2004 to January 2006. These events show various shapes: symmetric doughnut shape, symmetric disc shape and asymmetric doughnut shape elves, respectively. From the EMP model, it is suggested that vertical, horizontal and oblique lightning discharges generate these different shapes.

To investigate the characteristics of parent lightning discharges producing these different shapes of elves, we are observing the magnetic field component of sferics in ELF band (1-100 Hz). Using these ELF data, we can get information on the polarity and charge moment values of parent lightning discharges.

We have calculated the polarities and charge moment values of 324 elve events observed by the ISUAL for the period between July 2004 and February 2005. It is found that the number of elve events induced by negative CGs and positive CGs are 249 and 75, respectively. The occurrence probability of negative CGs and positive CGs inducing elves are almost the same in the regions of North America and the Atlantic Ocean, while the number of elves induced by negative CGs is greater than that of positive CGs in the region of the Indian Ocean, South-East Asia, and the Pacific Ocean. The average charge moment value of positive CGs inducing elves is 790 Ckm, while that of negative CG is 446 Ckm.

Furthermore, we will report the results on the regional and seasonal dependences of polarities and charge moment values, and will discuss the relationships between the parameters characterizing elves observed by FORMOSAT-2 / ISUAL (shapes, diameters etc.), and the polarities and charge moment values of parent lightning discharges.