

## A comparative study on intermittent propagation mode of positive and negative leaders

\*Daohong Wang<sup>1</sup>, Ting Wu<sup>1</sup>, Nobuyuki Takagi<sup>1</sup>

1. University of Gifu

The mechanism of intermittent propagation mode of both negative leaders and positive leaders remain on one of the largest mystery in lightning physics. In order to shed some light on this mechanism, recently we have made a comparative study on the optical propagation characteristics of an upward positive leader and an upward negative leader recorded using a high speed video camera operated at 300000 fps. The negative leader is a typical stepped leader with a few branches, while the positive leader exhibited both continuous propagation mode and intermittent mode.

It was found that each step of both positive and negative stepped leaders starts with a stem. For the positive leader, this stem usually initiates at a distance more than 100 m ahead from the tip of the leader, while for the negative leader, the stem usually initiates at a distance of around 50 m. The stem in the negative leader usually lasts less than 25 us, while the positive leader stem could last over 300 us. All the stems tend to progress in bi-direction modes. Although the backward propagation (in relative to the leader propagation direction) speed of the stem for both leaders are similar, the forward propagation speed of the negative leader stem is much larger than that for the positive leader stem. In the final paper, we will not only report on the detailed results but also try to present a schematic to explain the reasons of the differences.

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