

Yuecen Liu, Relativistic Doppler Effect in Lightning Discharges

Summary:

The objective of this project is to implement into a computer code a revised return-stroke current distribution along a vertical lightning channel considering relativistic Doppler Effect and analyze the models' performance by reproducing typical features of experimental measured electromagnetic fields.

To achieve this aim, work has been carried out as follows:

- Brief review of lightning phenomenology, return stroke modeling and relativistic Doppler Effect applied to an extending transmission line.
- Revision of existing computer code based on the relativistic Doppler Effect applied to lightning and comparison with simulation results of the original model.
- Sensitivity analysis and assessment of performance of the revised model in reproducing typical features of lightning electromagnetic fields at various distances.

The revised return stroke current distribution taking into account relativistic Doppler Effect has shown a better ability to reproduce the typical features of experimental observed electromagnetic fields compared to classical models.