

## Abstract

**Pascal Toma Bleuler, "Lightning flashes to tall structures: Effects of an upward connecting leader on the return stroke current and associated electromagnetic fields", 2016.**

In this thesis, we modify existing return stroke models for lightning flashes to tall structures so that we account for the possible presence of an upward connecting leader. Our newly developed model results in return stroke current distributions that are different from the case with no leader. The model is integrated into an existing computer code to compute electromagnetic fields associated to lightning return strokes. We show that the presence of an upward connecting leader does indeed influence the electromagnetic field by increasing it for the far field while decreasing it at very close distances. Some leader lengths even increase the field derivative maxima for the first peak. We conclude that for elevated strike objects exceeding a certain height, and for the far field, the electromagnetic field peak is determined by the length of the upward connecting leader. The connecting leader that results in the highest peak remains constant for a given set of reflection coefficients and a fixed channel base current. Our model is further extended with the inclusion of reflections at the return stroke wavefront.