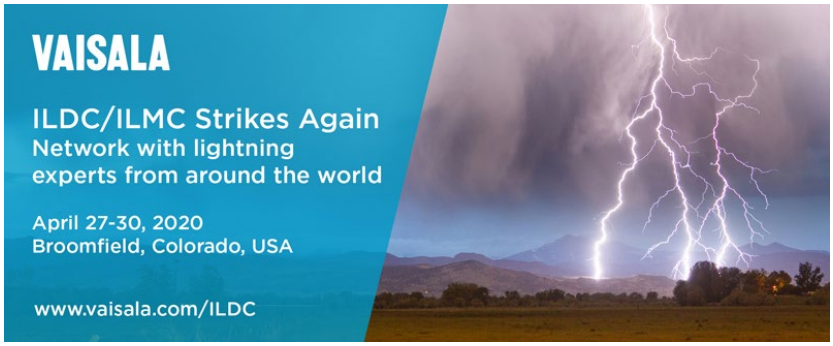

Assessment of the EUCLID-System on the Basis of Various Current Pulses from Upward Lightning Measured at Peissenberg Tower

Authors

Mr. Christian Paul - University of the Federal Armed Forces Munich

Prof. Fridolin H. Heidler - University of the Federal Armed Forces Munich

Dr. Wolfgang Schulz - OVE Service GmbH, Dept. ALDIS

Abstract

We present various types of current pulses from upward lightning, which were measured between 2011 and 2018 at the Peissenberg Tower, Germany. In total, 38 negative and 2 positive flashes, containing 199 current pulses, are analyzed. 49 out of 199 current pulses were from return strokes, 133 current pulses were ICC-pulses (superimposing the initial continuous current) and 17 were M-components (superimposing the continuing current of a preceding return stroke). For a more detailed analysis we classified the current pulses into various types, based on their waveform. This classification process is done in accordance to the waveform criterion, introduced by Paul and Heidler in 2018.

The evaluation of the performance of the EUCLID-system is based on these various types of current pulses. Generally, the EUCLID-system detected 51 (25.6%) out of the 199 current pulses. 40 out of 51 (81.6%) were from return strokes and the remaining 11 (8.5%) were ICC-pulses or M-component current pulses. The peak currents ranged from 0.1 kA to 40.8 kA. During the performance evaluation it is figured out, that the detected current pulses can be split up into two groups.

We assume that a first group of 9 current pulses (6 ICC-pulses, 3 return strokes) is related to branches of nearby downward lightning which got in contact with the tower. In these cases the EUCLID-system reported much higher peak currents (more than 100%) compared to the peak currents measured at the Peissenberg Tower.

Further we assume that a second group of 42 current pulses (4 ICC-pulses, 1 M-component current pulses, 37 return strokes) is related to upward lightning initiated from the top of the tower. In these cases the peak current inferred from EUCLID deviates much less from peak current measured at the Peissenberg Tower. A peak current overestimation by about 20% by the EUCLID-system could be found out. The peak currents ranged from 3.1 kA to 40.8 kA, the geometric mean (GM) was 9.4 kA. Furthermore 30% of these events were misclassified as intra-cloud pulses by the EUCLID-system. The GM of the location error was 161 m for all events, and 132 m considering only the return strokes.

Topic Areas

Lightning Detection Systems Technology and Performance, Tower-Initiated and Rocket Triggered Lightning

Submission Format

Oral