

## An unusual multiple-stroke positive cloud-to-ground lightning flash with different terminations

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An unusual positive cloud-to-ground (CG) lightning flash with three-stroke was observed by synchronous multifrequency radiation sensors. Its 3D channel development was carefully mapped. The results show that three positive strokes grounded at different points approximately 4-8 km apart and time intervals between neighboring CGs were 85 ms and 222 ms. This +CG flash was preceded by an intracloud (IC) discharge. The locations of the termination points on the ground were just below the pre-established horizontal IC discharge channels, and the 3 strokes, associated with shared horizontal negative leader channels inside the cloud, were linked with each other. There were stepping pulses less than 0.4 ms before the first and second return-stroke (RS), and their location results were distributed nearby the following RS, which suggests that might be associated with the attachment process. The first and second positive strokes occurred when the horizontal in-cloud negative channel stopped extending, while the third positive stroke occurred below the opposite end of an advancing negative leader in the cloud. The above results suggest that the downward positive leader preceding the strokes developed either from different decayed leader channels or from the opposite end of an advancing leader channel.

Keywords: positive cloud-to-ground (CG) lightning flash , Three positive return strokes, Channel mapping, Decayed leader channels , Advancing leader channel