

Initial leader of intra-cloud flashes in an isolated Tibetan thunderstorm

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Thunderstorms occurred in Tibetan plateau are usually characterized with isolated structures and in many cases exhibit positive dominant electric field on the ground. Such particular thunderstorm characteristics have attracted authors to carry out a systematic lightning observation campaign there from July 23rd to August 10th of 2005. Totally, we set up seven observation sites, and used various sensors which include 2 all-sky cameras, 5 field mills, 7 corona current detectors, 5 slow antenna, 5 fast antenna and 7 thunder detectors. The outputs from those sensors are recorded with several types of data recorders being operated at different sampling rates for various purposes. All the recorders at 5 main sites are synchronized by GPS. Except for fast antenna, the outputs from all the remaining sensors are recorded continuously during thunderstorms. This paper presents in detail the data and the analyzed results for an isolated weak thunderstorm which exhibits positive dominant electric field at the ground. The thunderstorm lasted about 1 hour and produced 15 lightning. Based on the electric field measured at multiple sites, all the lightning are identified as inverted polarity intra-cloud discharges which neutralized positive charge in lower position, somewhere around the cloud bottom and negative charge in higher position. Based on the electric change occurred during the leader initiation stage, the leader initiation heights are estimated to be around 2.5 km above the ground. Based on the timing information of the pulses which are contained in the initial electric change, the pulses are located some height below the leader initiation heights. Combined all these results, we inferred that all the leaders are initiated near the lower positive charge region and involved a bidirectional propagation of positive and negative leader system. The positive leader propagates upward to the upper negative charge region and the negative leader propagates downward inside the lower positive region.