Geophysical Research Abstracts
Vol. 14, EGU2012-1417-1, 2012
EGU General Assembly 2012

Bursts of Regular Magnetic Field Pulses Produced by Lightning Discharges

I. Kolmasova (1), O. Santolik (1,2), and P. Novak (3)

(1) Institute of Atmospheric Physics AS CR, Prague, Czech Republic (iko@ufa.cas.cz), (2) Faculty of Mathematics and Physics, Charles University, Prague, Czech Republic, (3) Czech Hydrometeorological Institute, Prague, Czech republic

We analyze bursts of regular microsecond-scale magnetic field pulses produced by lightning discharges. We measure waveforms of the broadband magnetic field derivative from the lightning discharges in the frequency range 5kHz - 37MHz. We analyze the data collected during the ground-based observational campaign in summer 2011 in Prague, Czech Republic. The recorded data originated from three thunderstorms that occurred in the vicinity of the receiving station.

We have found more than 40 bursts of unipolar pulses in the waveforms of integrated magnetic field. Both positive and negative pulse polarities have been observed. Usually, all pulses within the burst have the same polarity. Each burst has a typical duration of 100 – 400 microseconds. It contains several tens of pulses. Each of these pulses has a width of a few microseconds and a time interval to the next pulse is 4 -7us. The amplitudes of the pulses often decrease with time within a given burst. We were able to analyze the shape of individual pulses in detail thanks a sampling frequency of 80MHz.

For the first time we report the timing properties of individual pulses. The duration of the leading edge typically is 0.1us, the duration of the trailing edge is 0.2 - 0.4us for positive pulses. The leading and trailing edges of negative pulses are approximately twice as long compared to the edges of positive pulses.

The microsecond-scale pulse bursts are believed to occur in a part of the ramp-like field change characteristic for the K-change. Similar bursts are probably associated with a hook-shaped field change characteristic for the M-component.

We have compared our measurements with the return stroke data obtained from the lightning detection network CELDN. Knowing the usual position of the K-change and of the M-component in relation to the strokes we have tried to match the bursts with appropriate strokes.