Means for Calibration of Lightning Detection Systems
Intended for the Lightning Physics Topic

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The use of Lightning Detection Systems (LLS) has been contributing to improve the knowledge about lightning. The characterization of the geographical distribution of lightning incidence rates has been useful for several applications. The location of specific lightning events (and, in certain cases, the lightning peak-current estimate) can be fundamental information in certain scientific studies, required for developing interpretations of lightning processes and effects.

Nevertheless, the reliability of the data provided by LLS requires the system calibration. Most of the calibration processes used by LLS manufacturers are based on procedures that explore redundant information about the detected events to check the consistency of the estimates provided by the LLS. Also, triggered lightning have been used to calibrate the system and to calculate the errors involved in the peak-current estimates provided by LLS, though such evaluations are developed in limited areas (not over the whole area covered by the system) and they only considers lightning currents similar with those of subsequent return strokes.

It seems that LLS had not been calibrated for currents above 45 kA and also for first strokes (in addition to positive lightning) yet. In this context, the availability of ground truth references for such events becomes very interesting in LLS calibration procedures. Unfortunately, such references are typically obtained only in stations provided with instrumented towers, which suffers of the same problem: they provide references only to limited regions.

This aspect has motivated the authors to develop a cheap device that can be easily installed close to elevated structures to record the return stroke currents of lightning events striking to the structure. Composing networks of such devices distributed in a large area covered by a LLS is a feasible task that could be employed to calibrate this LLS all over such area.

In the proposed work, the first results provided by the device developed by the authors are presented an discussed in light of accurate records of current measured for the same lightning events by the measuring system installed at the instrumented tower of Morro do Cachimbo Station, in Brazil. Based on such first records, it is shown that the device, whose operation is based in the detection of the near magnetic field, is able to properly recover both the amplitude and waveform of the return stroke current, for calibrations purposes.