E1-10 Charge and size distribution of raindrops

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Measurements of electric charge, speed and the size of raindrops from clouds over Colombo, were carried out using ground equipment during the month of April, 1996. Although it is generally considered that the charge on precipitation particles plays a major role in the electrification of thunderclouds, the amount of reliable data taken within thunderclouds is sparse and little. The charge of a raindrop can be inferred from ground based measurements. These charge measurements give an idea about the maintenance of the negative charge on the earth and the electrification of thunderstorms.

The instrument used here, is based on the principle of the induction ring method consisting of two identical brass cylinders (diameter = 4.2 cm, length = 5.3 cm) kept in tandem at a distance 0.5 m apart and aligned towards the direction of incoming raindrops connected to a high voltage generator. The calibration for droplet size and charge was performed using simulated rain droplets obtained by using a set of hypodermic needles of various sizes connected to a high voltage generator. The time interval between two voltage pulses, recorded on a storage oscilloscope, due to a raindrop passing through the two induction cylinders, was used to calculate the terminal velocity of raindrops.

Four showers were studied during April 1996. In the present study we captured a large number of droplets (155) with improved calibration techniques on the instrumentation compared to the previous preliminary study which was mainly on the construction of the measuring instrumentation with number of droplets studied being limited to 30 droplets.

Of the 155 raindrops captured, the diameter of the smallest and the largest raindrops were 0.72 mm and 1.50 mm, respectively and the mean value of the drop diameter was 0.78 mm.

The electric charge of raindrops varied between -79 pC and +88 pC with a mean value of 49 pC.

Using the data obtained from the 4 showers, the calculated maximum value of excess of charge brought down by precipitation is 204 nC m^{-2} and the maximum precipitation current density is 242 pA m^{-2}.

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