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Observations of positive lightning flashes using Córdoba Marx Meter Array

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Abstract

Compared to negative cloud-to-ground flashes, positive cloud-to-ground lightning flashes are less studied due to the fact that positive cloud-to-ground lightning flashes only account for 10 percent or less of global cloud-to-ground lightning flashes. The occurrence context and initiation of positive lightning flashes are complex still not well understood. In this study, the characteristics of positive cloud-to-ground lightning were studied using the Córdoba Marx Meter Array (CAMMA). The CAMMA consists of ten second-generation Huntsville Alabama Marx Meter Array (HAMMA 2) sensors, operated at Córdoba, Argentina during the Remote sensing of Electrification, Lightning, And Mesoscale/microscale Processes with Adaptive Ground Observations (RELAMPAGO) field campaign in late 2018. The CAMMA can provide detailed depictions of various lightning processes due to the upgrades in hardware and location technique. The CAMMA usually gives more complete lightning maps in comparison to that of a co-located lightning mapping array in the field campaign. A large number of positive cloud-to-ground lightning flashes were recorded by the CAMMA and the analysis is underway. Initial results show that almost all of the positive lightning flashes were preceded and followed by intracloud activities. The sources associated with preliminary breakdown pulses before positive return strokes were clearly mapped by the CAMMA. The polarity of preliminary breakdown pulses depends on the direction of leader propagation. Interestingly, some initial sources before the preliminary breakdown process were found for some flashes. The CAMMA sources associated with the stepped leader pulses before positive return strokes will also be presented. Multi-stroke positive cloud-to-ground flashes (including flashes in which strokes shared the same channel) will be presented.

Topic Areas

Lightning Physics, Characteristics and Measurements

Submission Format

Oral