On how estimates of the lightning peak current depend on the altitude of the 35 dBZ radar reflectivity in São José dos Campos, Brazil and Tucson, Arizona, USA

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ABSTRACT: In an effort to understand better the wide variations in the values of the estimated peak current in negative cloud-to-ground lightning, we have analyzed the radar reflectivity of the parent storm in conjunction with data provided by comparable lightning locating systems (LLS). These data were obtained in three measurement campaigns, two in São José dos Campos, Brazil, and one in Tucson, Arizona, USA. The radar datasets were obtained from weather radars that were operating near each observation site. We examined the locations of the ground strike points that were reported by the LLS together with the heights of the most recent and closest 35dBZ and (the higher) 18 dBZ radar echos (the latter is also known as ECHOTOP). The 35 dBZ echo is related to the larger elements of precipitation and is used as a proxy for the presence of graupel, an important constituent for cloud electrification. So, using these two heights, we could infer the height of the negative charge region in the cloud, and the depth of the electrified cloud. The results show an increase in the peak current as the height of the 35 dBZ echo increases, and as the ECHOTOP increases in all three campaigns. This analysis did not take into account the height of the lightning origins, just the estimated depth of the charge region near where the lightning occurred. A comparison of these and previous results, and the possible reasons for the dependence will be discussed.

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