Microphysics, Kinematics and Electrical Activity of Hail Producing Storms during SOS-CHUVA Project

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We present an analysis of hail producing storms on the Metropolitan Region of Campinas to identify key factors for hailfall occurrence. For the first time, a hail detection network installed in the region allowed the identification and determination of thunderstorm intensity in the 2016-2017 period. The life cycle, microphysical structure and kinematics of specific cases were studied using three meteorological radars installed in São Paulo state and a lightning detection network, with tools such as tracking of convective systems, hydrometeor identification and Multi-Doppler 3D wind retrieval. The analyzed cases had low hailfall intensity when compared with scales applied in Europe, with 22.4 mm maximum hail diameter. The 2017-03-14 case presented the longest lifetime (6.2 h), hailfall in two locations (11.8 mm maximum hail diameter) and the most intense lightning activity (107 (31) flashes/min IC (CG) maximum rate), while the 2017-11-15 case, with a shorter lifetime (2.2 h), presented low electrical activity (46 (20) flashes IC (CG) total) with the most intense hailfall (22.4 mm maximum hail diameter). All hailfall cases of the specific cases mentioned earlier are associated with a extensive hail column identified by the polarimetric radar and up to 30 m/s updrafts before the events; the bigger hail in the 2017-11-15 case possibly had the contribution of liquid precipitation (associated with larger downdrafts) which prevents hail size decrease as well as contributes to its growth below the cloud base. Some key factors found in both cases were the increase in electrical activity before or after hailfall, the presence of hail in a extensive layer within cloud and the updrafts within mixed phase layer contributing to hail formation and growth.