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Surface electrostatic field and lightning activity under stratiform storms

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The electrostatic field is permanently measured at Centre de Recherches Atmosphériques (CRA) in south-western France (43.13 N 0.37 E, 600 m altitude) thanks to a field mill. It is recorded with a 1-second time resolution and simultaneously to the precipitation current measured with a specific sensor. Both parameters have been analyzed in storm situations typical of mesoscale convective systems (MCS). Data from national networks Météorage and ARAMIS are used to characterize these storms. They consist of cloud-to-ground (CG) lightning location and typical parameters as polarity, peak current and multiplicity for the former and radar reflectivity fields at low altitude for the latter. So, several storm cases have been investigated and some features seem to be relevant to this kind of storm. The electrostatic field intensity can reach larger values below the stratiform region compared to below the convective region, from 5 to 6 kV m-1 and from 2 to 3 kV m-1, respectively. Its polarity is commonly negative (downward field) below the stratiform region and it can reverse as the rainfall carries positive charge to the ground. So, the mirror effect is generally observed between electrostatic field and precipitation current. The electric field intensity can indicate the presence of large amounts of charge within the cloud above a site while the lightning strokes remain relatively far. Some remote CG flashes can induce large amplitude field variations, especially in the cases of positive ones, which indicate the charge removed by a positive CG flash can be horizontally displaced compared to the ground stroke location. CG lightning flash sequences associated with an initial positive CG flash are observed in the stratiform area.