

Corona Emission Thresholds for Graupel-Graupel Collisions close to the 0C Isotherm in Thunderclouds

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Laboratory studies have been conducted of the threshold conditions under which glancing collisions between pairs of graupel pellets or small hailstones which are either melting or in wet growth, produce a corona discharge in a vertical electric field E . The observed corona is found to be emitted at the tip of an ephemeral liquid filament, of length comparable with the dimensions of the interacting hydrometeors, drawn out during each interaction. The probability f that corona was produced during an inter-action increased steadily from zero for increasing values of E above about 200kV/m, and was significantly in excess of 50% for values of $E=400$ kV/m, which is probably about the maximum ambient value occurring in a thunderstorm. The results relate to collisions at relative velocities V characteristic of those occurring in thunderstorms. We conclude that this mechanism of corona initiation could be of importance and lead to the production of lightning in regions of a thundercloud where the temperatures are close to 0C. It thus appears that corona can be initiated from solid or liquid hydrometeors of precipitation dimensions at all temperatures at which lightning is commonly initiated.