



## **Simulation of processes of artificial lightning initiation by model hydrometeors array using artificial thunderstorm cells**

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Nowadays, there are the significant opinion to the theoretical and experimental investigations of the discharge initiation and propagation by the arrays of the large hydrometeors (hails) as to the clarification of the hydrometeor hypothesis of the lightning initiation as to the search of the possible methods of an active influence on the thunderclouds. Such investigations are especially interesting to the severe thunderstorms when the large amount of the hail is in the clouds. Applications of the artificial thunderstorm cells gives the new possibilities for the studying of these problems.

Results of the experimental simulation of the processes of the artificial lightning initiation between the thundercloud and the ground by the model hydrometeor arrays using the artificial thunderstorm cells are presented. Artificial thunderstorm cells of positive and negative polarity (with potential up to 1.1 MV) were under the investigation. Two key questions have been considered: (1) parameters of the model hydrometeors array that could be the best for the discharge initiation; (2) key mechanisms of an interaction between the hydrometeor array and the thunderstorm cell of negative or positive polarity providing the successful initiation and propagation of the channel discharges between the thundercloud and the ground.

Results of more than one thousand experimental shots of the discharge initiation and development stimulation in the gap “artificial thunderstorm cell of negative or positive polarity – ground” have been generalized in the presented paper. The following parameters of the large model hydrometeors array have been considered: form of the model hydrometeors (volume or thin plate hydrometeors), mean of the combining of the hydrometeors into the group, disposition of the model hydrometeors array in the gap “artificial thunderstorm cell of negative or positive polarity – ground”.

It has been found that the probability of the channel discharge initiation and propagation stimulation between the charged cell and the ground significantly depends on the hydrometeor form, mean of their combining in the array, and location of the hydrometeors array relative to the artificial thunderstorm cell. Moreover, it has been established that the influence the considered parameters of the model hydrometeor array on the artificial discharge initiation between the charged cell and the ground depends on the polarity of the artificial thunderstorm cell too. Parameters of the model hydrometeors array that could be the best for the channel discharge initiation and propagation stimulation between the artificial thunderstorm cell and the ground have been presented and discussed in the paper.

Possible key mechanisms of an interaction between the hydrometeor array and the artificial thunderstorm cell of negative or positive polarity (corona discharge on the hydrometeors, spark discharges between the neighboring hydrometeors, streamer and leader discharges formed on the hydrometeor array) providing the successful initiation and propagation of the channel discharges between the thundercloud and the ground are considered in the paper. Problems of the scaling of received results to the possibilities of the artificial lightning initiation are discussed too.

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