

论文

雷暴电活动对冰雹增长影响的数值模拟研究

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摘要: 利用三维强风暴动力-电耦合模式, 数值模拟了风暴演变过程中电活动对冰雹增长及地面降雹的影响. 结果指出, 带电冰雹与云内强电场作用使地面降雹量增加约50%[HTK]霰[HTSS], 雹块直径增大0.7mm, 降雹时间滞后约3min. 文中还讨论了强电场通过对水成物降落速度的调制来影响冰雹微观增长过程, 即主要是影响碰并过程和冰雹融化过程. 电活动使冰雹源、汇总量都减少, 但汇总量减少更多, 总体效果使冰雹总量增加, 数目减少, 冰雹长得更大, 更易降落到地面.

关键词: 雷暴数值模式 电荷结构 冰雹增长 微观相变

Numerical modeling for effects of electric activity during thunderstorms upon the growth of hail particles

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Abstract: ■Using the 3D dynamics electrification coupled model, we simulate the effect of electric activity on hail growth and shooting on the surface during thunderstorms. The results indicate that the hail with charge and strong electric field make precipitation and diameter of hail particles on the ground increase 50%[HT5K]霰[HT] and 0.7mm, respectively, and the time of hail shooting lag 3 minutes. Effect of microphysical growth process of hail through the strong electric field act on the fall speed of precipitation elements is discussed. Electric action mainly influences collection and melting process of hail. Source and sink of hail decrease, and sink decrease more. So, the total amount of precipitation of hail will increase, and the number of hail particles decreases due to electrical effects. It means that hail particles become bigger and easier to fall.

Keywords: Numerical model of thunderstorm Charge structure Growth of hail particles Phase transformation of microphysical process

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1. 赵阳;张义军;董万胜;张鸿发;陈成品;张彤. 青藏高原那曲地区雷电特征初步分析[J]. 地球物理学报, 2004,47(3): 405-410
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