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论文

雷暴云准静电场对夜间电离层D区的影响

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摘要： 模型，计算了雷暴云电荷突然对地放电后QE场大小 在0～90km高度上的分布. 对200C的正电荷对地放电后的计算表明，在放电1ms后，在65～78km的区域内，QE场大于大气的雪崩电场，而0.5s后，该电场迅速衰减到很低的水平. 在电 离层高度上，由于电子的热化时标和电离时标极短，在QE场的作用下，夜间局部低电离层会 有比较大的响应. 对Boltzmann方程数值求解的结果表明，在某些高度上，电子分布函数有 明显的高能尾巴；在63～83km的高度上，电子平均能量为3eV＜ε＜6eV；计算的电子数 密度 的峰值扰动表明，在65～78km的高度上，电子的数密度增加，最大的电离峰值约在74km处， 大约增加了3个数量级，比电磁脉冲（EMP）的电离效果大得多.

关键词： QE场 夜间电离层 D区 峰值电离

THE EFFECT OF THUNDERSTORM CLOUD QUASI-ELECTROSTATIC (QE)FIELD ON THE NIGHTTIME IONOSPHERIC D REGION

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Abstract: The quasi electrostatic (QE) field caused by a sudden discharge of thu nderstorm cloud is calculated for the altitude range from 0km to 90km by using a self

consistent model.It is assumed that a positive charge of 200C is displace d to ground within 1ms. The numerical results show that 1ms after the initiation of the discharge the QE field is greater than the breakdown field of neutral atm osphere at height 65～78km above the thunderstorm, and 0.5s later the QE field d ecreases very quickly. Because the thermal and ionization time scale are very sh ort at the ionospheric height, the local nighttime lower ionosphere should be su bstantially affected by the large QE field. By numerically solving Boltzmann equ ation, it is shown that the electron distribution function has a high energy ta i l at some altitudes, for example, 73km, and the electron averaged energy is abo ut 3eV～6eV at heights of 63～78km. The results also show that the electr on density increases between 65km and 78km, and the