

论文

核爆炸光辐射探测中的大气传输性能研究

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摘要:

从核爆炸光辐射特点出发, 结合我国中纬度地区大气特点, 研究了(0.2~1.2)μm波段大气传输性能。通过实际测量数据分析可知, 大气对(0.2~1.2)μm光辐射起主要作用的成分有水蒸气、二氧化碳和臭氧的分子吸收和散射以及气溶胶大粒子的散射。综合考虑这些因素, 改进了水平路径传输上(0.2~1.2)μm光辐射大气传输经验方程。计算机仿真结果表明: 该方程能体现我国中纬度地区光辐射的传输情况, 对(0.4~0.8)μm可见光波段能很好地吻合。将(0.4~0.8)μm波段光辐射大气传输定量计算结果直接应用到基于可见光辐射探测的核爆炸探测子系统中, 模拟核爆炸探测, 实验结果表明: 与传统大气传输计算软件的定性结果相比, 该方法的测量精度有明显的提高。

关键词: 核爆炸 光辐射探测 光吸收 光散射 大气传输

Atmosphere transmission in detection of nuclear explosion light radiation

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Abstract:

Based on the characteristic of light radiation by nuclear explosion, in combination with the atmospheric characteristic in the middle latitude area in China, the atmospheric transmission performance of light radiation at (0.2~1.2)μm wave band was studied. It is found, through the analysis of the actual measured data, that the main compositions in atmosphere to affect the (0.2~1.2)μm light radiation are the molecular absorption and the scattering of steam, carbon dioxide and ozone, as well as the scattering of big aerosol granules. The atmospheric transmission empirical formula for the horizontal transmission of the (0.2~1.2)μm light radiation was improved with these factors. The result of computer simulation indicates that the formula can best describe the atmospheric transmission of the light radiation in middle latitude area in China in the (0.4~0.8)μm visible light wave band. The result of quantitative calculation for (0.4~0.8)μm wave band light radiation was directly used in the nuclear explosion subsystem, which took the visible light radiation to simulate the nuclear explosion. The experimental result indicates that more accurate measurement can be achieved with the atmosphere transmission software.

Keywords: nuclear explosion detection of light radiation light absorption light scattering atmospheric transmission

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