

论文

高原地区云对地闪电首次回击的光谱研究

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摘要: 用无狭缝光栅摄谱仪, 获得了青海西宁地区云对地闪电首次回击过程400~700nm波长范围的光谱, 并首次在闪电的单个回击光谱中记录到了波长为604.6nm和619.4nm的谱线. 将原子结构的理论应用于闪电光谱的研究, 用多组态Dirac-Fock方法, 计算了有关光谱线的波长、振子强度以及相应的激发态能量等参数, 理论与试验观测资料进行比较分析后发现, 高原地区闪电首次回击光谱的结构及跃迁特性与其他地区有明显的区别, 除NII离子 $n=3$ 的低激发态产生的跃迁谱线外, 激发能量为13~14eV左右的中性NI和OI的跃迁增多, 但很难观测到OII离子的跃迁谱线.

关键词: 闪电光谱 NI、OI、NII离子 MCDF方法

Spectral study on lightning return stroke in plateau area

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Abstract: The spectra in the range of 400~700nm for first return strokes of CG lightning flashes have been obtained in the Qinghai plateau using a slitless spectrograph, and new lines of 604.6nm and 619.4nm are recorded. Applying the Large scale multi configuration Dirac-Fock wave functions, we calculated the parameters such as wavelength, oscillator strengths and excited energy for the transitions related to lightning spectra. The most important effects of relativity, correlation, and relaxation are included in the computational model. Comparison of the calculated results with experimental spectra shows that the spectra in plateau area have a distinctive characteristic. Beside the lines of lower excited state with $n=3$ in NII ions, transitions of NI and OI are increased, their excited energy is around 13~14eV, and there are rarely lines from OII ion.

Keywords: Lightning spectra NI、OI、NII ions MCDF method

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