

## 云闪电通道内的粒子密度及分布特征

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## The particle densities and distributions in cloud lightning chan

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摘要

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### 摘要

依据在中国青藏高原地区得到的6幅云闪电通道的光谱,由谱线波长、相对强度和跃迁几率等信息,结合等离子体理论,放电通道的温度和电子密度;进而,利用Saha方程、电荷守恒和粒子数守恒方程,得到了粒子处于各电离级上的数密度、压强和平均电离度等参数,并对云闪通道内部粒子数分布特点进行了分析.结果表明,与地闪回击通道类似,云闪通道:电离,通道内部以单次电离的离子为主,且NII离子数密度最高.具有较高温度的通道位置处,中性和一次以上电离离子数密度和相对值都较高,但是,不同温度下NII、OII、ArII粒子的相对浓度变化不大.与地闪回击通道不同,云闪同一放电通道内处粒子数密度差异较大,且沿通道没有显示规律性变化,通道压强从零点几到几兆帕.

关键词: 云闪光谱 粒子数密度 质量密度 压强 平均电离度

### Abstract:

According to plasma theories, the temperature and electron density are calculated from the wavelength intensities and transition parameters of lines in cloud lightning spectra which have been obtained on plateau. By using Saha equations, electric charge conservation equations and particle conservation equations, particle densities in every ionized-state, the mass density, pressure and the average ionizability of each channel are obtained. Moreover, the characteristics of particle distributions in each discharge channel are analyzed. The results show that cloud lightning channels are almost completely ionized, and the most part is singly ionized while NII has the highest particle density. In general, the particle densities and concentrations of different channel positions also have positive correlations with temperatures except for ArII, of which relative concentrations show tiny tendencies of becoming low along the temperature increasing. Differing from Cloud-to-ground lightning, the particle densities of different positions along cloud discharge channel change in a bigger range but show no regularities. The pressures change in from several to tens of atmospheres.

Keywords: [Spectra of cloud lightning](#) [Particle density](#) [Mass density](#) [Pressure](#) [Average ionizability](#)

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