

论文

偏振-米散射激光雷达的研制

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摘要:

研制的偏振-米散射激光雷达(PML),可用于探测卷云和沙尘气溶胶的后向散射光退偏振比以及研究流层大气气溶胶的消光特性。采用窄带滤光片和光阑,将接收到的激光大气回波信号谱线(米散射和瑞利散射光谱)从天空太阳背景噪声中分离出来,以提高系统的白天探测能力。介绍了偏振-米散射激光雷达的结构、技术参数、测量方法和数据处理方法。对偏振-米散射激光雷达的性能参数进行了测定,并对测定结果进行了分析与讨论,给出了偏振-米散射激光雷达对合肥市地区(117.16°E, 31.90°N)上空大气气溶胶的消光特性和卷云的结构、退偏振比垂直廓线以及光学厚度的典型探测结果,对这些结果进行了分析和讨论。结果表明:研制的偏振-米散射激光雷达性能可靠,能对大气气溶胶和卷云的物理和光学特性进行有效的探测。

关键词: 偏振-米激光雷达 气溶胶的消光系数 卷云结构 消光系数 退偏比

Development of polarization Mie-scattering lidar

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Abstract:

The polarization Mie-scattering lidar (PML) can be used for detecting the depolarization ratio of cirri and aerosol backscattering wave, and investigating the extinction characteristic of aerosols in the atmosphere. In order to improve the detection capability in daytime, a narrow band interference filter and diaphragm are employed in the system to separate the received laser return signals consisting of Mie-scattering signal and Rayleigh scattering signal from the background noise. The overall structure, specifications and measurement method of PML are described. The fundamental principle of PML is briefly introduced. The main performance parameters of PML were determined, and the results were analyzed. The typical detected results of extinction characteristic of aerosols and the structure of cirri at Hefei(117.16°E, 31.90°N) are presented and discussed. The primary observational results over Hefei show that the performance of this lidar is reliable. And it has the ability to detect the physical and optical characteristics of the cirrus and aerosols.

Keywords: polarization Mie-scattering lidar extinction characteristic of aerosol structure of cirrus extinction coefficient depolarization ratio

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