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论文

基于差分吸收激光雷达的云消除算法研究

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摘要:

差分吸收激光雷达测量臭氧浓度过程中,云层信号会造成对流层臭氧浓度剧烈的抖动,带来了很大的测量误差.本文提出了一种云消除算法,该算法通过插值云层高度区域内的臭氧浓度,有效消除了对流层臭氧浓度的剧烈抖动.通过阐述其理论基础,给出了其算法关键点,即云信号的识别和云高度的精确定位.根据云层消光系数的特点,通过设定气溶胶消光系数阈值获取云层高度信息,利用累加平均有效减少噪音造成的测量误差.结果表明,在精确确定云高、云底的基础上,运用线性插值算法对臭氧测量结果进行修正,可以有效克服云层对测量结果造成的急剧起伏.

关键词: 差分吸收激光雷达 云消除技术 Fernald方法 双波长差分吸收 云层高度

A Cloud Elimination Algorithm Based on Differential Absorption Lidar

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Abstract:

The cloud signals can cause severe wobble of tropospheric ozone concentration in the process of differential absorption lidar measurement of ozone concentration, and bring significant errors. A cloud elimination algorithm is presented. The algorithm effectively eliminate tropospheric ozone wobble by interpolating the ozone concentration in cloud height region. The key point of the cloud algorithm is given through expounding its theoretical basis. The key point of the cloud elimination is the discrimination of cloud signal and accurate positioning of the cloud height. The cloud height information is determined by setting the aerosol extinction coefficient threshold according to the characteristics of the cloud extinction coefficient. The cumulative average of retrieved ozone concentration reduces measurement errors caused by noise. The results show that the correction by interpolation algorithm of ozone measurements in cloud region could overcome the wobble of the ozone measurements caused by clouds.

Keywords: Differential absorption lidar Cloud elimination technique Fernald method Dual-wavelength differential absorption Cloud height

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