量子电子学报 2013, 30(1) 116-122 DOI: ISSN: 1007-5461 CN: 34-1163/TN

激光雷达专辑

基于LabVIEW大气激光雷达数据采集与可视化软件的设计

陈超[1,2]，宋小全[1]

1中国海洋大学海洋遥感研究所， 山东 青岛 266003；
2山东省海洋环境监测技术重点实验室 山东省科学院海洋仪器仪表研究所，山东 青岛 266001

摘要：

介绍了基于LabVIEW编程语言开发的米散射大气激光雷达数据采集与可视化软件。设计中利用LabVIEW调用光子计数卡（MSA300）的动态链接库，实现了激光雷达软件对大气回波数据的实时采集与显示，根据Fernald方法即时处理回波信号并显示消光系数与回波强度时间高度显示图（THI）。软件采集的数据直接转换并保存为ASCII码文本格式，便于数据的后期处理与分析。初步实验效果表明，软件能够对大气回波信号、消光系数与THI图进行实时可视化显示，便于直观了解大气激光雷达连续探测的大气气溶胶和云时空变化信息。实验表明，软件具有良好的实时性与准确性。

关键词： 大气激光雷达 LabVIEW 动态链接库 数据采集 软件设计

LabVIEW software design of data acquisition and visualization for atmospheric lidar

Chen Chao [1,2] , Song Xiaoquan[1]

1 Ocean Remote Sensing Institute, Ocean University of China, Qingdao 266003, China;
2 Shandong Provincial Key Laboratory of Ocean Environment Monitoring Technology, Institute of Oceanographic Instrumentation, Shandong Academy of Sciences, Qingdao, Shandong, 266001, China

Abstract:

The data acquisition and visualization software of Mie lidaris developed based on LabVIEW.It can acquire and display data of lidarinreal time by LabVIEW calling the dynamic link library of photon counting card (MSA300). The extinction coefficient is inversed by Fernald method and displayed with time-height-indication (THI) figure. The software convertsand savesthe data as ASCII format to be post-processed and analyzed.Lidar experiments show that the atmospheric data, extinction coefficients and THI can be displayed in real time by the software to intuitive understand the spatial and temporal changes of the aerosol and cloud.

Keywords: atmospheric lidar LabVIEW dynamic link library data acquisition software design

收稿日期 修回日期 网络版发布日期

DOI:

基金项目:

中国气象科学院灾害天气国家重点实验室开放课题(2010LASW-A07)，城市气象科学研究基金(UMRF201002)，海洋公益性行业科研专项(201205036)

通讯作者: 宋小全（1976-）山东莱州人，博士，主要从事激光遥感遥测研究。

作者简介: 陈超（1982-）山东青岛人，研究生，主要从事激光雷达大气探测研究。

作者Email: songxq@ouc.edu.cn

参考文献：

[1] Liu Zhishen, Wu Dong, Liu Jintao, et al.Low-altitude atmospheric wind measurement from the combined Mie and Rayleigh backscattering by Doppler lidar with an iodine filter [J]. Applied Optics, 2002, 41(33): 7079-7086.

[2] Wang Xiaobin, Hu Huanling, Li Chen, et al. Raman-Mie lidar measurements of aerosol wavelength exponent in the troposphere

[J]. Chinese Journal of Quantum Electronics (量子电子学报), 2006, 23(3):341 (in Chinese).

[3] Gong Wei, Zhang Jinye, Mao Feiyue, et al. Measurements for profiles of aerosol extinction coefficient, backscatter coefficient, and lidar ratio over Wuhan in China with Raman/Mie lidar
[J]. Chinese Optics Letters, 2010, 8(6): 533-536.

[4] Campbell J.R., Hlavka D.L., Welton E.J., et al. Full-time eye-safe cloud and aerosol lidar observation at atmospheric radiation measurement programsites: Instruments and data processing
[J]. Journal of Atmospheric Oceanic Technology, 2002, 19, 431-442.

[5] Zhang L., Cao X., Bao J., et al. A case study of dust aerosol radiative properties over Lanzhou,China
[J]. Atmos. Chem. Phys., 2010, 10: 4283-4293.

[6] Martucci, Giovanni, Conor Milroy, et al. Detection of cloud-base height using Jenoptik CHM15K and Vaisala CL31 ceilometers
[J]. J. Atmos. Oceanic Technol., 2010, 27: 305-318.

[7] Welton J., Campbell R.. The NASA micro-pulse lidar network (MPLNET): an overview and recent results
[J]. Opt. Pur. YApl., 2006, 39: 67-74.

[8] Arthur Molina Carrilo, Eduardo Landulfo, Nilson Dias Vieira Junior, et al. Automation of a lidar system using Labview software for unattended measurements and use in a meteorology virtual course
[J]. Opt. Pura. Apl., 2008, 41(2): 97-100.

[9] Liu Zhishen, Liu Bingyi, Li Zhigang, et al. Wind measurements with incoherent Doppler lidar based on Iodine filters at night and day
[J]. Applied Physics B, 2007, 88: 327-335.

[10] Zhang Yixiong, Gu Haiming. Realization of data acquisition based on calling DLL in LabVIEW
[J].Control & Automation (微计算机信息), 2008, 24(12-1):78-79 (in Chinese).

[11] Hu Shunxing, Wang Zhenzhu, XuQingshan,et al. Studies on methods for aerosol optical depth measurements by lidar
[J]. Chinese Journal of Quantum Electronics (量子电子学报), 2006, 23(3):307 (in Chinese).

[12] Y. Bhavani Kumar, S. Vijaya Kumar Varma. An algorithm for retrieval of aerosol properties from lidar observations. International Journal of Engineering Science and Technology
[J], 2010, 2(9): 4043-4050.

[13] Frederick G. Fernald. Analysis of atmospheric lidar observations: some comments
[J]. Applied Optics, 1984, 23(5): 652-653.
[14] Chen Tao, Wu Decheng, Liu Bo, et al. A new method for determining aerosol backscatter coefficient boundary value in the lower troposphere
[J]. Acta Optica Sinica(光学学报), 2010, 30(6):1531-1536 (in Chinese).

本刊中的类似文章

1. 陈少华 黄春晖.LabVIEW在零差相干光检测系统的应用[J]. 量子电子学报, 2009,26(3): 371-375