

Study of Large-Scale Smoke and Dust Transport from Observations by CALIOP and Solar Photometers

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We present the results of the development of an algorithm and the LIRIC-2 software package for retrieving the vertical profiles of optical characteristics and concentrations of aerosol fractions from coordinated measurements by the CALIOP satellite lidar and ground-based solar radiometers of the AERONET network.

The backscatter signals recorded by the CALIOP satellite lidar in the vicinity of the AERONET radiometric stations, together with the results of ground-based radiometric measurements coordinated with the satellite flyby, form an input data package that is processed by regularizing algorithms developed for solving ill-posed inverse problems. The use of CALIOP data in coordinated lidar and radiometric experiments (LRS-technique) will create more than 400 potential sites for complex lidar and radiometric sounding of aerosol around the globe.

A test version of the LIRIC-2 software package has been developed to reconstruct the altitude profiles of optical characteristics and concentrations of aerosol fractions in LRS experiments. In this version lidar data can be provided by ground-based lidars and (or) by CALIOP.

To implement the CALIOP data option, the new sub-package was included into LIRIC-2 software package for extracting and preprocessing satellite lidar data.

The main limitation for the practical use of CALIOP data in a complex lidar and radiometric experiment is the decrease in the signal-to-noise ratio in CALIOP data due to clouds and low aerosol load in the area of the selected radiometric station.

The results of a number of complex lidar and radiometric experiments have been processed to retrieve the parameters of various types of aerosol during its transport over the Eurasian continent and in the coastal regions of Antarctica.

Monitoring of the long-range transport of forest fire smoke and dust from arid regions seems to be a prospective area of application for integrated lidar and radiometric sounding using CALIOP data with minimal operator involvement into data processing procedure.

Data from CALIOP and solar radiometers in North Africa and Southeast Asia pave the way for regular LRS dust observations in the Sahara and Gobi desert regions. The results of observations of a developed radiometric network in North America make it possible to apply the LRS technology to monitor wildfire smoke in this area.

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