Direct problems of laser sensing of aerosol and cloud atmosphere

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Under real conditions the microphysical and optical properties of atmosphere are subjected to randomly-inhomogeneous fluctuations in time and space. Therefore direct and inverse problems of laser sensing should be considered in a stochastic formulation. In this case the initial optical parameters are defined in the form of random functions of space and time. Monte Carlo method is the most appropriate for solution of radiative transfer equation with stochastic parameters.

In this paper the light haze of a ground-based pulse LIDAR in an altitude-wise optically inhomogeneous cloud-free atmosphere were computed for various optical-geometrical parameters of the experiment using the Monte Carlo method. A feature of these calculations is altitude-wise statistically inhomogeneous structure of aerosol scattering parameters in optical model of cloudless atmosphere. The correlations between aerosol scattering coefficients and the echo-signal time distribution were carried out.

The echo-signals reflected by lower boundary of liquid-drop clouds for a ground-based pulse LIDAR were simulated. The echo-signals were computed in the assumption of statistical variation of the altitude of the lower cloudiness boundary. In the calculations local estimates [1] and their new effective modification [2] were employed.

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