

ON LIDAR SOUNDING OF THE ATMOSPHERE TO ESTIMATE
STATIC AND DYNAMIC CHARACTERISTICS OF AEROSOL INHOMOGENEITIES

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ABSTRACT

1. A possible application of intensity fluctuations of a pulse light signal reflected by atmospheric aerosols is analyzed by the correlation method to evaluate static (medium sizes, shape) and dynamic (speed and direction of movement, lifetime) characteristics of aerosol inhomogeneities. The aerosol inhomogeneities are assumed to be expanded, pressed, disintegrated and originated constantly in accordance with random laws, the set of inhomogeneities as a whole traveling together with air masses and having predominant movement in wind direction. It is shown that the characteristics of aerosol inhomogeneities considered can be expressed by the coefficients of the correlation function expansion of the reflected signal fluctuation intensity in Taylor series.

2/ Correlation systems for evaluating static and dynamic characteristics of driving objects can be divided into two types according to the kind and quantity of used information: the systems with coordinates of the information removal "points" to be fixed in space, and the systems with a parallel simultaneous information removal at discrete moments of time.

The systems for determination of wind direction considered in [1,2] are the examples of the first type system. However, the operating information removal for two points is insufficient to estimate completely static and dynamic characteristics of inhomogeneities, their quantity ought to be increased up to three of them for two-dimensional problem and up to four of them for three-dimensional problem as it is usually done in the ionospheric studies.

The second type systems are used for the investigation of a medium shape and speed of the clouds according to photographs made from satellites. These

systems are also used for solution of navigation problems [3].

The use of optical quantum generators with a scanning beam is seen to increase greatly the working information removal in comparison with the first type systems. Nevertheless, scanning rate is not sufficient sometimes in order to consider a general picture of aerosol inhomogeneities to be stationary. In this connection the use of the systems of second type treatment becomes a matter of essential difficulty.

3. Aerosol inhomogeneities simulation has been carried out on the basis of the digital computer experiments with the aim of estimating static and dynamic characteristics of inhomogeneities by an optical beam in the atmosphere at different scanning procedures.

The dependence of determination accuracy of these characteristics on the type of chosen laws of aerosol particle distributions in the atmosphere, the parameters of inhomogeneities geometry, their speed and the law of scanning have been obtained.

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