ON THE PROBLEM OF METEOROLOGICAL CONDITIONS INFLUENCE ON LASER BEAM SCATTERING IN ATMOSPHERIC GROUND LAYER

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ABSTRACT

Measurements were taken of extinction, backward scattering, indicatrix asymmetry of laser beam scattering as well as of the searchlight scattering in the atmospheric ground layer. Simultaneously meteorological parameters were registrated such as pressure, humidity, and temperature. Meteorological parameters influences upon extinction backward scattering, and scattering indicatrix asymmetry are analyzed.

Helium-neon (632.8 nm) and ruby (694.3 nm) lasers as well as searchlight with interference filters were used. Optical characteristics were analyzed with respect to their dependence on meteorological parameters for Black Sea coast climate, semi-desert climate, town haze conditions, and for Mountain Observatory. For these four observation places dependence of scattering indicatrix asymmetry on relative humidity appears to be the same. When relative humidity increases the asymmetry coefficient monotonely increases too.

Extinction and backward scattering dependence on relative humidity is more complicated. Efforts to establish any relationship between them were not successful. But some series of observations prove that these characteristics are dependent on relative humidity. When obtaining curve of extinction σ vs relative humidity to consider hysteresis effect which is widely discussed lately it has been taken into account whether relative humidity increases or decreases.

It was learned that σ and $M(180°)$ dependence on relative humidity r is rather different for different climates. For maritime climate extreme dependence of σ and $M(180°)$ on r is observed. For the range $20\% < r < 60\%$ values of σ and $M(180°)$ steeply increase when increases, and for $r > 70\%$

rapid decrease of σ and $M(180°)$ is observed while r increases. For several other places of observation increase of σ with increase of relative humidity is obtained. Sometimes this phenomenon is followed by increase in $M(180°)$ with increase in r.

In the present paper it has been shown that for all places of observation including town haze conditions relative humidity essentially influences optical properties of atmospheric aerosols.