DOUBLE-SCATTERING CALCULATIONS COMPARED WITH LABORATORY DYE-LASER MULTIPLE SCATTERING MEASUREMENTS

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ABSTRACT

The multiple-scattering effects on laser pulses transmitted through and scattered by clouds and aerosol layers were calculated and discussed by many authors. Special treatment has been given to the case of double-scattering and its effect on lidar returns. In contrary to the body of literature on the theory of multiple scattering, very few experimental works were conducted under controlled and well defined conditions. This is especially true for the scattering properties at a given scattering angle as a function of the wavelength. In this work the results of the laboratory measurements of the multiple scattering as a function of wavelength for various optical depths (measured separately for one wavelength) are presented.

As the optical depth increased, the multiple-scattering processes affected the scattering curves, the main characteristics of which can be summarized as follows:

1. The maxima and minima are gradually smoothed out, an effect which is more pronounced for the minima.
2. Within a range of optical depth values the multiple scattering values can be found by interpolation.

This last result is valuable for the determination of the multiple scattering effect for an arbitrary optical depth.

The experimental results are compared with theoretical double scattering calculations developed by the group.