MULTIPLE SCATTERING DEPOLARIZATION IN MARINE STRATUS CLOUDS: LIDAR EXPERIMENTS

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ABSTRACT

The depolarization of ruby lidar backscattering caused by multiple scattering in marine stratus clouds has been examined systematically from a field site on the southern California coast. Investigated were the effects on the linear depolarization ratio δ of lidar receiver field-of-view (FOV), elevation angle and laser beam pointing errors. An approximately linear increase in maximum δ values was observed with increasing receiver FOV, and the importance of accurate transmitter/receiver beam alignment was demonstrated during experiments in which the laser axis was deliberately misaligned. An elevation angle dependence to the δ values was observed as a consequence of the natural vertical inhomogeneity of water cloud content above the cloud base. Time histories of the depolarization characteristics of dissipating stratus clouds revealed significant spatial and temporal variability in δ values attributed to cloud composition variations. Employing a 1 mrad transmitter FOV, maximum δ values of 0.21 and 0.33 were observed with 1 and 3 mrad receiver FOVs, respectively, from the low stratus clouds. The fundamental causes and effects on the lidar equation of multiple scattering will also be discussed.

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