Multiple scattering from liquid cloud measured by using a polarization lidar with two fields of view

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Liquid clouds play a key role in the earth radiation budget, the liquid droplet size and concentration are two important parameters in the research of liquid cloud radiation character. A linearly polarized laser pulse from lidar penetrates into liquid cloud, multiple scattering will occur in the cloud, and the lidar received multiple scattering signal will be depolarized [1]. The received multiple scattering signal will enhance the received signal intensity and depolarization ratio. The proportion of the multiple scattering signal in the received signal was mainly determined by the receiver's field of view (FOV), liquid droplet size and concentration. The multiple scattering signal could be obtained from lidar received signals with different FOVs, and the liquid droplet size and concentration could be retrieved from the multiple scattering signal [2].

A polarization lidar with two FOVs was developed to retrieve liquid droplet effective size and concentration from the multiple scattering in the liquid cloud. The lidar system was introduced, and the depolarization ratio was calibrated by rotating a half-wave plate in the laser transmitter. The lidar measurements of multiple scattering from liquid cloud are shown and discussed. The results indicated that the polarization lidar with two FOVs could be employed to measure the droplet effective size and concentration in the liquid cloud.

References

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[2] Roy G., L. Bissonnette, C. Bastille, *et al.*, 2014: Retrieval of droplet-size density distribution from multiple-field-of-view cross-polarized lidar signals: theory and experimental validation. *Appl. Opt.* **38**, 5202–5211.

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