Inexpensive Cloud LIDAR for aerosol attitude measurement

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This paper represents the prototype of an inexpensive lidar using high power laser diode. In conventional lidar methods, the aerosol altitude was measured by direct transmission and backscattered laser signal were achieved. The abovementioned accuracy is depending on signal time-of-flight. In this system, a new method with respects to light intensity was investigated. The aerosol backscattering light signal was collected, both telescope and timer were replaced by the parabola plate.

From lidar equation [1],
\[ P(R) = \frac{E c A}{2 R^2} \beta T_{opt} T^2(R) \]  
(1)

And according to our experiment, the percentage of reflection and backscattered light power related on voltage measurement, the above equation is then approved to the appropriate situation as,
\[ h = \frac{2}{\alpha} W \left( \alpha \sqrt{\frac{E c A \beta T_{opt} C}{2 P}} \right) \]  
(2)

The experiments results showed that the aerosol level is corresponding to the lidar equation with accuracy more than 99%. From the demonstrated results we can applied this technique for all lidar based system.

Fig. 1 Attitude result at 9.0 m

Fig. 2 Intensity diminish at 450.0 nm wavelength