CLidar Profiling of Aerosols at Mauna Loa Observatory

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CLidar (camera lidar) is a method of profiling boundary layer aerosols that has been developed at Mauna Loa Observatory (MLO). The method uses wide angle optics (100 degrees) to image a laser beam onto a CCD camera. The image is then analyzed for aerosol and molecular scattering using geometry to assign altitudes to the image pixels. The advantage over the standard lidar method is the very high vertical resolution all the way to the ground. There is no overlap function and the dynamic range needed is much less than in lidar detection. The equipment is also simpler than that required by the lidar method. In August, 20005 a solar powered camera was deployed above MLO for weekly observations. The measurements were usually right after sunset often profiling the transition from upslope air laden with local aerosols to clean upper tropospheric air. The plot below (Figure 1) shows the scattering ratio (aerosol/molecular) for a three hour period at MLO during such a transition. The vertical profiles were taken every 5 ½ minutes and the vertical resolution is less than 1 meter near the surface (bin 0). The clean free tropospheric air initially starts above 400 meters (bin 380) but reaches the surface by the end of the three hour period.

A more sensitive, lower noise CCD camera and wide angle lens have been tested with a significant improvement in performance. In addition, a shutter (chopper) has been constructed to block background light between laser shots in preparation for boundary layer measurements in Hilo where background light will be much greater than at MLO.

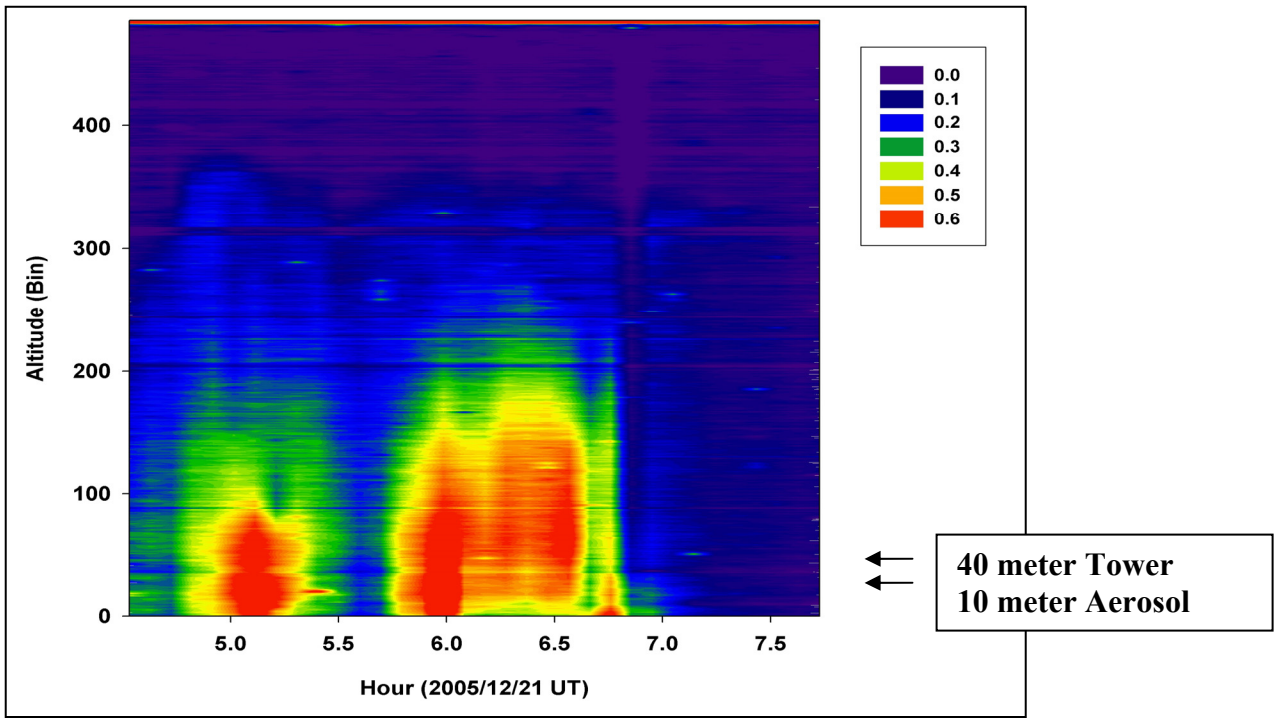

Figure 1. Scattering ratio (aerosol/molecular) for a three hour period at MLO showing the transition from upslope air (prior to 7 UT) to clean down slope air (after 7 UT).