Aerosol-Cloud Interactions as Observed by Remote Sensors and In-situ Aerosol Measurements

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Over the past years we have demonstrated first measurements of aerosol-cloud interactions using ground-based remote sensors at a continental US site. The response of a cloud to changes in the aerosol is quantified in terms of a relative change in cloud drop effective radius for a relative change in aerosol under conditions of equivalent cloud liquid water path. This is done in a single column of air at a temporal resolution of 20 s (spatial resolution of ~100 m). Cloud drop effective radius is derived from a cloud radar, microwave radiometer, and/or, a multifilter rotating shadowband radiometer. Aerosol properties are derived either from lidar (extinction) or from surface aerosol measurements acquired by NOAA's Global Monitoring Division. This is a process-based approach, in which we selectively sample updrafts, at scales appropriate to cloud drop activation. In this talk we will give a brief overview of the method and present a sample of results.

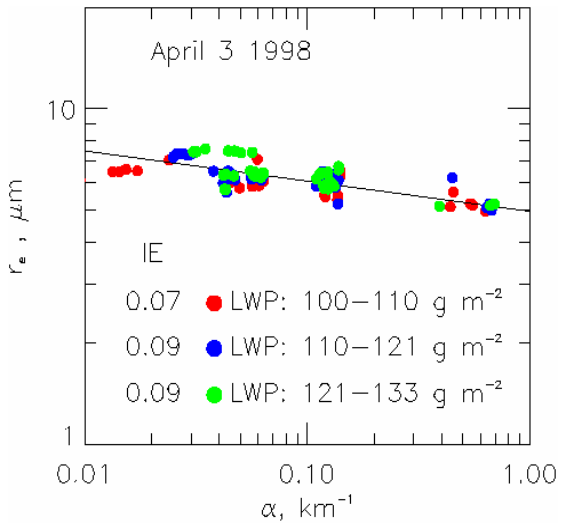

Figure 1. Drop effective radius as a function of aerosol on April 3 1998 for three different LWP bands as indicated in the legend. Drop size r_e is retrieved from radar and microwave radiometer. Extinction α is measured by the lidar at an altitude of 350 m. The slope of the lines, which is a measure of the cloud microphysical response to changes in aerosol, is given by IE.