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](image-url)  

**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 \( \alpha \) 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.