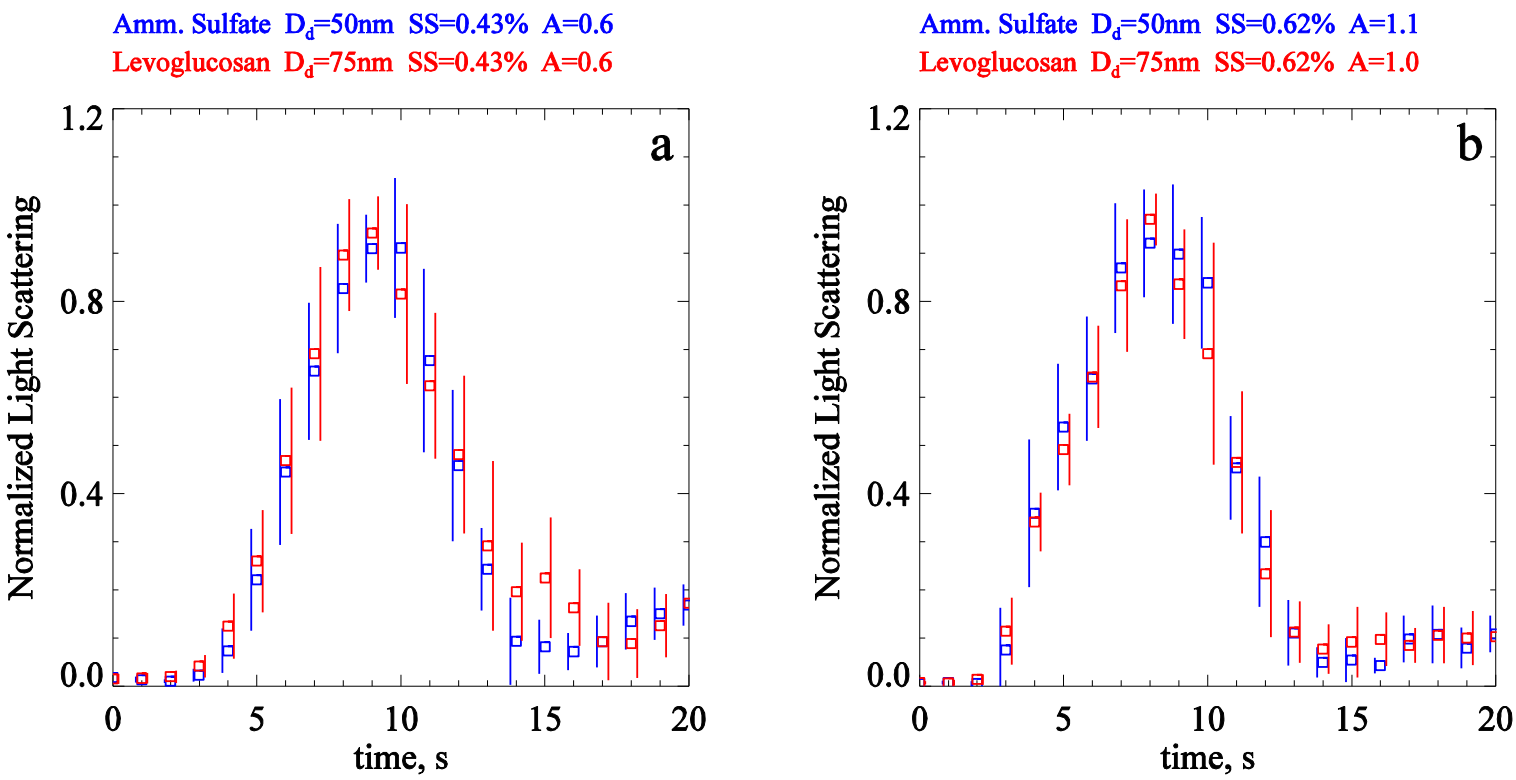
Figure 2009JD012618-fs01.eps (see below) examines measurements made by the Laramie CCN instrument during LExNo. The quantity analyzed is laser light scattered from droplets formed on both pure levoglucosan and pure ammonium sulfate particles. Time zero is at the beginning of the 20 s detection interval and averages of the normalized light scattering signal, acquired from several detection intervals, are plotted (squares).

The basis for this analysis is Delene and Deshler (2000) who show that the time required for droplets to grow to a size that sediments from the Wyoming chamber varies inversely with maximum chamber supersaturation. Secondary dependencies are, inter alia, dry particle size, particle hygroscopicity and the accommodation of water vapor at the droplet surface. These dependencies are expected from consideration of cloud droplet growth kinetics (Pruppacher and Klett, 1997).

The figure shows results for levoglucosan (red), and ammonium sulfate (blue), at two maximum chamber supersaturations, SS=0.43% and SS=0.62%. Values of the dry particle diameter are 75 nm and 50 nm for levoglucosan and ammonium sulfate, respectively. This size difference compensates for the larger hygroscopicity of ammonium sulfate, resulting in nearly the same active fraction at SS=0.43% (A=0.6), and at SS= 0.62 (A~1).

In addition to the average of the normalized light scattering (squares) the figure shows vertical lines extending above and below the squares indicating plus and minus one standard deviation of the average. Data from 17 ammonium sulfate, and 30 levoglucosan detection intervals are summarized in the left panel. In the right panel, data from 18 detection intervals, for both the ammonium sulfate and the levoglucosan, are summarized.

The figure demonstrates that levoglucosan produces slightly more scattering, early in the development of the light pulse (e.g., at 4 s in the left panel and at 3 s in the right panel), but these differences are small relative to the variability. It is also apparent that the time corresponding to the peak of levoglucosan scattering is indistinguishable from that for ammonium sulfate. Prior investigators (Oliveira and Vali, 1995; Shantz et al., 2003; Stroud et al., 2007; Asa-Awuku et al., 2009) have presented data analyzed in a manner similar to that shown in the Figure. Those studies demonstrated that an organic aerosol component is associated with a delay in light scattering. This is not the case for the light scattering data shown in the Figure. We conclude that pure levoglucosan particles activate with the same kinetics as ammonium sulfate particles characterized by a comparable value of critical supersaturation.



2009JD012618-fs01.eps - Normalized light scattering, from the Laramie CCN instrument, for droplets formed on ammonium sulfate and levoglucosan particles. Time zero is at the beginning of the 20 s detection interval and averages of the normalized light scattering signal, acquired from several detection intervals, are plotted (squares).

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