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Optical and microphysical properties of organic multicomponent aerosol particles

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Atmospheric aerosols affect Earth's climate in direct and indirect manners. The direct effect of aerosols on climate is by scattering and/or absorbing incoming solar and outgoing terrestrial radiation, which strongly modify Earth's radiation budget. In addition, aerosols acting as cloud condensation nuclei (CCN) indirectly affect climate and precipitation by modifying the microphysical properties of clouds and cloud coverage. These climatic effects depend on the chemical composition, size and morphology. We will present laboratory studies aiming at understanding how the organic component of atmospheric affect the climate system Specifically, we present the use of cavity ring down (CRD) spectrometer to derive the extinction and complex refractive index of aerosols containing a significant organic component. By precisely measuring extinction as a function of particle size the real and imaginary refractive indices are obtained, and the single scattering albedo may be calculated.. We will present results on aerosol particles containing humic like substances (HULIS). HULIS are a common component of aerosols in the atmosphere. They contribute to the CCN activity, hygroscopic properties and the density of aerosols. In addition, HULIS absorb throughout the visible range, and hence contribute to the direct climatic effect of aerosols. The absorption by organic aerosols is largely unaccounted for in models. Specifically, we will present how the absorption of aerosols containing HULIS and inorganic salts varies with wavelength, test various optical mixing rules and will present results on the extinction of core-shell particles. In addition, we will discuss how the presence of HULIS affects the surface tension of CCN at activation and of cloud droplets and its implications.