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Evolution of the character of multicomponent aerosol and the effects on physico-chemical properties

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Atmospheric aerosol particle populations, wherever they are measured, invariably contain organic material. If the organic components are mixed within the same particles as inorganic components, field and modelling studies indicate that the properties of the particles are largely determined by the relative proportion of these fractions. For an externally-mixed population and particles dominated by organic components, the nature of the organic fraction will dominate the properties. With particle photochemical age, this nature may change, affecting the ability of the particles to take up water in the sub- and supersaturated atmosphere.

Field measurements often employ operationally-defined simplification of aerosol composition in order to overcome the problems associated with the vast complexity of the organic fraction. Such simplification is also required for model descriptions of the thermodynamics and of gas / aerosol partitioning. There is an obvious sensitivity of the accuracy of aerosol description to such simplification. This sensitivity will be discussed and effects on predicted sub-saturated water uptake presented. In addition, effects of the limitation of field resolution of aerosol mixing state on predicted cloud droplet formation will be presented. Evidence for the effect of compositional dependence of cloud droplet activation from field and chamber studies will be presented as will a demonstration of the necessity for chamber studies to be carried out a near ambient concentrations of aerosol precursor in order to capture realistic atmospheric water uptake behaviour with increasing photochemical age.