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Novel insights about salting-effects and reactivity of soluble molecules in aqueous aerosols

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Organic carbon in the atmosphere modifies the lifetime of climate active gases such as O_3, and CH4 (oxidative capacity), and forms aerosols that affect Earth's radiation balance. Water soluble organic carbon (WSOC) molecules are well established to form secondary organic aerosol (SOA) in cloud water. However, the chemistry and rate of SOA formation in aqueous aerosol is less well known, and is typically ignored in atmospheric models. Aqueous particles provide a very different chemical environment than clouds, i.e. they are the most concentrated aqueous salt solution that can be found on Earth. As a result of high ionic strength, phase separations of inorganic and organic phases, mass transfer limitations and viscosity effects affect the chemistry in aqueous particles, which proceeds via essentially different reaction pathways than in clouds. Of particular importance in this context is the Henry's law partitioning coefficient. Laboratory experiments show activity coefficients of 1/500 for Henry's law partitioning coefficients of glyoxal in concentrated aqueous aerosol- salt solutions. This salting-in mechanism is investigated in laboratory experiments, and shown to be a major driver in the rate of secondary organic aerosol (SOA) formation from the multiphase chemistry of soluble species like glyoxal. This solicited talk will summarize and discuss new experimental findings from simulation chamber experiments, and bulk reactor experiments to assess the Setschenow salting behavior of soluble molecules in different aqueous seed types, and study the effect of anthropogenic triggers such as sulfate and ammonium for the reactivity of multiphase reactions in the aerosol aqueous phase.