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Radius and vapor pressure of a single levitated organic aerosol particle using white light resonance spectroscopy

A. Zardini, U. Krieger, T. Peter
Institute of Atmosphere and Climate Science, ETH-Zürich. (zardini@env.ethz.ch)

Low vapor pressures are difficult to measure in general, and it is especially challenging to perform measurements at low temperatures typical for aerosol particles under upper atmospheric conditions. Oxygenated organic compounds (i.e. dicarboxylic acids) of very low vapor pressures in the atmsophere originate on the one hand from direct emissions and on the other hand from biogenic and anthropogenic precursors. There is considerable interest in understanding the formation but also the partitioning between gas and particle phase of these compounds because of their influence on atmospheric chemistry and on the radiative properties of the aerosol. In order to predict the partitioning it is important to know the vapor pressure of the compounds and its dependence on temperature and composition of the aerosol. Here we report an attractive and technically simple alternative approach to measure the evaporation rate (and hence the vapor pressure) of an organic aerosol particle, namely making use of a “white” light source with high spatial coherence to illuminate a levitated microdroplet and excite its resonance spectrum which is recorded by an optical multichannel analyzer.