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Aerosol droplets: Nucleation dynamics and photokinetics[1]

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This talk addresses two fundamental aerosol processes that play a pivotal role in atmospheric processes: The formation dynamics of aerosol particles from neutral gas phase precursors and photochemical reactions in small aerosol droplets induced by ultraviolet and visible light. Nucleation is the rate determining step of aerosol particle formation. The idea behind nucleation is that supersaturation of a gas leads to the formation of a critical cluster, which quickly grows into larger aerosol particles. We discuss an experiment for studying the size and chemical composition of critical clusters at the molecular level. Much of the chemistry happening in planetary atmospheres is driven by sunlight. Photochemical reactions in small aerosol particles play a peculiar role in this context. Sunlight is strongly focused inside these particles which leads to a natural increase in the rates of photochemical reactions in small particles compared with the bulk. This ubiquitous phenomenon has been recognised but so far escaped direct observation and quantification. The development of a new experimental setup has finally made it possible to directly observe this nanofocusing effect in droplet photokinetics.

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