



Graduate School Event

Thesis Defense: Microscale Electrical Behavior of Highly Charged Individual Aerosol Particles Using Optical Tweezers

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Host: Jorryt Matthee

Charge accumulation on aerosol particles plays an important role in a variety of natural and industrial processes. An example is cloud electrification, in which collisions between ice crystals and graupel cause large amounts of charge to be exchanged between airborne particles. Optical tweezers are a highly specialized tool that can hold a single micrometer-sized airborne particle stably in the same position over weeks while measuring its electric charge with elementary-charge resolution. In this work, we show that the trapping laser can also be used to give charge to the microparticle. Via a two-photon process the particle acquires more and more positive charge, enabling us to study its electrical behavior from uncharged up to multiple hundred elementary charges. By studying the dynamics of such highly charged particles over days and weeks we find that they spontaneously undergo microdischarges which range from just a few to several hundred elementary charges. We show that these discharges are triggered by cosmic-ray muons which pass through the air close to the particle and supply the ions needed to cause charge loss. Our findings highlight the potential of aerosol optical tweezers to provide new insights into microscale charging and discharging phenomena, with implications for both fundamental studies and atmospheric electrification processes.

Wednesday, September 9, 2026 01:00pm - 02:00pm

Central Bldg / O1 / Mondi 3 (I01.O1.010)



This invitation is valid as a ticket for the ISTA Shuttle from and to Heiligenstadt Station.

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