UNDERSTANDING INFRARED SPECTRA OF AEROSOLS ON A MOLECULAR LEVEL

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The study of aerosol particles with sizes in the submicron range is a highly interdisciplinary endeavor at the junction of nanosciences, atmospheric physics, and astrophysics. The microphysics of aerosol clouds in the atmospheres of planets and their moons, such as ammonia clouds on Jupiter and Saturn or methane aerosols on Titan, is currently very much in the focus of the scientific community. Particularly broad interest has been sparked by the recent Cassini-Huygens mission to Saturn's moon Titan, which has illuminated the importance of methane clouds for Titan's weather and their analogy to the role of water ice clouds in Earth's atmosphere.
The present contribution focuses on the influence of intrinsic particle properties, such as shape, size or architecture, on infrared optical properties of icy aerosol particles. Intrinsic particle properties manifest themselves in mid-infrared extinction spectra by modifying the structure of vibrational bands. We ultimately aim at unravelling the microscopic origin of the characteristic patterns found in the spectra of these weakly bound molecular aggregates. To this end we compare our experimental results with different model calculations combining molecular dynamics simulations with vibrational quantum dynamics.