FDIT206uj Atmospheric aerosol physics

Course description:

The primary motivations for studying atmospheric aerosols will be presented, along with their classification, origin, physicochemical properties, atmospheric lifetime, and physiological effects. Their role in cloud formation will also be discussed. The theoretical background of their spectral response, the applied measurement techniques, and the design and operational principles of the most commonly used instruments will be introduced. Furthermore, models for the spectral-based identification of emission sources and their comparative analysis will be examined. The principles and practical applications of aerosol photoacoustic spectroscopy will also be covered.

Course Syllabus:

1. Atmospheric aerosols and their physicochemical properties
2. Main motivations for studying atmospheric aerosols
3. Theoretical background of the spectral response of atmospheric aerosols
4. Methods for investigating particle size distribution: instruments and measurement techniques
5. Measurement of spectral response: instruments and measurement techniques
6. Aerosol photoacoustic spectroscopy and its practical applications
7. Spectrally based source identification models and their practical applications
8. Evolution of soot aerosols and methods of investigation

Recommended readings:

Fundamentals and Applications in Aerosol Spectroscopy: Edited By Ruth Signorell, Jonathan P. Reid, https://doi.org/10.1201/b10417

H. Moosmüller, R.K. Chakrabarty, W.P. Arnott, Aerosol light absorption and its measurement: A review, Journal of Quantitative Spectroscopy and Radiative Transfer, Volume 110, Issue 11, 2009, Pages 844-878, ISSN 0022-4073, https://doi.org/10.1016/j.jqsrt.2009.02.035

Konstantina Vasilatou, Kenjiro Iida, Mohsen Kazemimanesh, Jason Olfert, Hiromu Sakurai, Timothy A. Sipkens, Gregory J. Smallwood, Aerosol physical characterization: A review on the current state of aerosol documentary standards and calibration strategies, Journal of Aerosol Science, Volume 183, 2025, 106483, ISSN 0021-8502, https://doi.org/10.1016/j.jaerosci.2024.106483