Geophysical Research Abstracts
Vol. 13, EGU2011-12702, 2011
EGU General Assembly 2011

Measurements of the depolarization and intrinsic fluorescence properties of different aerosol samples

Ulrich Bundke (1), Björn Nillius (1), Joachim Curtius (1), Gregory Kok (2), Darrel Baumgardner (2), Roy Newton (2), and Patricia Keady (2)

(1) Universität Frankfurt, IAU, Institut für Atmosphäre und Umwelt, Frankfurt a. M., Germany (bundke@iau.uni-frankfurt.de), (2) Measurement Technologies, 2545 Central Avenue, 80301 Boulder (CO), USA

Abstract

Using the newly developed prototype Aerosol Particle Spectrometer with Depolarization and Fluorescence (APSDF) by Droplet Measurement Technologies and a modified BIO-IN Sensor [Bundke et al., 2010] the linear- and circular- depolarization properties of different test aerosol, dust samples , volcanic ashes as well as different biological particles were investigated. First results demonstrate that we are able to identify different particle populations in one sample by analyzing the density distribution of the sample using size, depolarization and fluorescence measurements as orthogonal coordinates of a 3-dimensional space.

Method:

The APSDF and the modified BIO-IN sensors both illuminate an aerosol beam with a 405nm laser. Particles will scatter the light. Particles of biological origin will also show intrinsic fluorescence emissions by excitation of mainly Riboflavin, also known as vitamin B2. Riboflavin is a substance, which is part of the citric acid cycle and omnipresent in all living cells. Fluorescence emissions are omni-directional and collected over a large solid angle by both instruments for wavelengths larger 420nm.

In case of the BIO-IN Sensor, the incident laser light is circular polarized by introducing a quarter-wave-plate tilted by 45° to the principal polarization axis. The circular depolarization ratio (p_{44}/p_{11}) of the scattering matrix is measured in backward direction by two photomultipliers at 110° scattering angle using a combination of a 405nm zero order quarter-wave-plate and a 405nm zero order beam splitting cube to analyze the two circular polarization components.

The APSDF measures the linear depolarization of the incident linear polarized laser light at 168° by the ratio the (horizontal) polarized scatter intensity measured at -168° to the total backscatter (measured at +168° scattering angle).

References:

Bundke, U., et al. (2010), Development of a Bioaerosol single particle detector (BIO-IN) for the Fast Ice Nucleus CHamber FINCH,*Atmospheric Measurement Techniques*, 3(1), 263-271.