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# Ambient and laboratory measurements of ice nuclei and their biological faction with the Fast Ice Nuclei CHamber FINCH-HALO using the new 405nm Version of the BIO-IN Sensor

U. Bundke, B. Nillius, H. Bingemer, and J. Curtius
Universität Frankfurt, IAU, Institut für Atmosphäre und Umwelt, Frankfurt a. M., Germany (bundke@iau.uni-frankfurt.de)

We have designed the BIO-IN detector as part of the ice nucleus counter FINCH (**F**ast **I**ce **N**uclei **CH**amber counter) to distinguish activated Ice Nuclei (IN) ice crystals from water droplets (CCN) (Bundke et al. 2008) and their fraction of biological origin (Bundke 2010). The modified BIO-IN sensor illuminates an aerosol stream with a 405 nm laser, replacing a 365nm LED of the original BIO IN design. Particles will scatter the light and those of biological origin will show intrinsic fluorescence emissions by excitation of mainly Riboflavin, also known as vitamin B2. The incident laser light is circularly polarized by introducing a quarter-wave-plate. The circular depolarization ratio ($p_{44}/p_{11}$) of the scattering matrix is measured in the backward direction by two photomultipliers at 110° scattering angle using a combination of quarter-wave-plate and a beam splitting cube to analyze the two circular polarization components. The detection limit was lowered towards particle size of about 400nm diameter (non activated particles). It is now possible to calculate the activated fraction of IN of biological origin with respect to all biological particles measured with one detector. The performance of the sensor will be demonstrated showing the circular- depolarization properties of different test aerosol, dust samples, volcanic ashes as well as different biological particles. Measurements on the mountain Puy de Dôme of IN number concentration of ambient air, as well as measurements at the AIDA facility in Karlsruhe of the IN activation curves from different bacteria are shown.

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