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Development of a Bioaerosol single particle detector (BIO IN) for the Fast Ice Nucleus CHamber FINCH

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Abstract

We present the setup and first tests of our new BIO IN detector [*Bundke, et al., 2009*]. This detector is designed to classify atmospheric ice nuclei (IN) for their biological content. Biological material is identified via its auto-fluorescence (intrinsic fluorescence) after irradiation with UV radiation. The use of auto-fluorescence of biological material is a common principle used for flow cytometry, fluorescence microscopy, spectroscopy and imaging. The detection of auto-fluorescence of airborne single particles demands some more experimental effort. However, expensive commercial sensors are available for special purposes, e.g. size distribution measurements. But these sensors will not fit on the specifications needed for the FINCH IN Counter (high sample flow of up 10 LPM). The newly developed -low cost- BIO IN sensor uses for its fluorescence channel a single high-power UV-LED instead of much more expensive UV lasers and is designed to be coupled to the Fast Ice Nucleus CHamber FINCH. If one particle acts as ice nucleus, it will be at least partly covered by ice at the end of the development section of the FINCH chamber. The detector combines an auto-fluorescence detector and a circular depolarization detector for simultaneous detection of biological material and discrimination between water droplets, ice crystals and not activated large aerosol particles to identify ice nuclei. Other key advantages of the new sensor are the low costs, compact size, and the little effect on the aerosol sample which allows it to be coupled with other instruments for further analysis.

The instrument will be flown on one of the first missions of the new German research aircraft “HALO” (High Altitude and LOng range).

References

Bundke, U., et al. (2009), Development of a bioaerosol single particle detector (BIO IN) for the fast ice nucleus chamber FINCH,*Atmos. Meas. Tech. Discuss., 2, 2403-2422.*

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