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First results on the concentration of biogenic airborne particles in the ABL collected with a new developed particle sampling unit carried by a multirotor UAV.

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In-situ measurements of the spatial distribution and transportation of atmospheric particles such as pollen, spores and particulate matter (PM) are of great interdisciplinary interest.

The few known state of the art in-situ measurement systems employ passive sampling units carried by fixed wing UAVs, thus providing only limited spatial resolution of the particle concentration. Also the sampled air volume is determined with low accuracy as it is only estimated by the air speed and the length of the flight path.

We will present a new approach, which is based on the use of a multirotor UAV providing a versatile platform. It's automated positioning system allows sampling with a very high spatial resolution.

First, a blower driven particle collecting unit, an inertial mass separator (impactor) was developed and installed on the UAV. Experiments to estimate the effect of the multirotor's downwash on the particle concentration where carried out.

Second, particle collection experiments in different altitudes of up to 300 m above ground were carried out in the vicinity of Tübingen.

Post flight on ground, the collected particles out of different altitudes were classified by type, size and number using light or scanning electron microscopy (SEM).
The volumetrical particle concentration was calculated by the sampled air volume, measured by a mass flow sensor.

The feasibility of placing an optical particle counter (OPC) on the multirotor UAV will be evaluated in future experiments.

The determination of type, size and number of airborne particles by in-situ sampling in combination with the very high spatial resolution provides not only valuable progress in agriculture, paleoclimatology and meteorology, but also opens up the application of multirotor UAVs in new fields, for example for precise determination of the mechanisms of generation and distribution of fine particulate matter.