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Octocopter investigation of the vertical and horizontal variation of ultrafine particles, fine particulate matter and soot in the traffic plume emitted from a Rhine river bridge in Duesseldorf, Germany

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For this study an octocopter UAV was used for carrying an ultrafine (UFP) particle monitor, an optical particle counter (OPC) and a micro aethalometer. The UFP-monitor, based on electrical charging of UFPs, was able to count the number of UFPs and give an estimated mean diameter of the measured particles. The OPC, based on the particle induced light scattering of a laser beam, was able to detect aerosols in a size range of about 250 nm to 32 μm in 31 bins. The micro aethalometer measured the soot by optical attenuation of a light beam which is caused by carbon particulate matter. The octocopter with a lift off weight by 10.5 kg was especially designed and constructed at the University of Applied Sciences, Duesseldorf, for the measurement of air pollutants. It was equipped with eight 900 W electric engines and a pixhawk flight control. Technically this octocopter was able to climb up to altitudes of up to 2 km AGL. However, during this study an altitude range of several 10 meters was used. During this study about 60 octocopter flights were performed. The flights clearly revealed a plume of UFPs coming from the traffic on the bridge. This result was confirmed by various upwind and downwind measurements with the octocopter in the region of the bridge.