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Boundary layer research with the Autonomous Mini Aerial Vehicle 'M2AV Carolo'

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The M2AV is a self constructed model aircraft with two electrically powered engines and a wingspan of two meters. The maximum take-off weight is 4.5 kg (the M2AV is therefore classified as an model plane which simplifies authority issues), including 1.5 kg of payload. It is hand-launched which makes operation of the aircraft easy. With an endurance of approximately 50 minutes, the range accounts for 60 km at a cruising speed of 20 m/s. The M2AV is capable of performing turbulence measurements (wind vector, temperature and humidity) within the troposphere and offers an economic component during meteorological campaigns.

The meteorological sensors are mounted on a noseboom to minimise the aircraft's influence on the measurements and to position the sensors closely to each other. Wind is measured via a small five-hole probe, an inertia measurement unit and GPS. The flight mission (waypoints, altitudes, airspeed) is planned and assigned to the aircraft before the semi-automatic launch. The flight is only controlled by the on-board autopilot system which only communicates with a ground station (laptop PC) for the exchange of measured data and command updates like new waypoints etc.

The talk will be focussed on the wind measurements and the in-flight wind calibration technique. Wind measurements were made during a field campaign in Lindenberg, Germany and the second data set is obtained during a 14 month campaign at Halley station, Antarctica. M2AV measurements of wind are compared with the 99m-mast and sodar in Lindenberg and the 30-m mast at Halley.