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In situ measurements of the temperature structure parameter over a heterogeneous land surface

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The dispersion of electromagnetic (radar) and acoustic (sodar) waves in the atmosphere is affected by the turbulent refractive index field. The transmitted signal is scattered, due to the refractive index variations in the atmosphere. These scattering of acoustic and electromagnetic waves can be used to observe the structure of the lower atmosphere (Wyngaard, 1980). Typically the structure parameters are measured by remote sensing systems (like scintillometers). However, to obtain data at various heights and various directions, small unmanned areal vehicles (UAV) can be used.

The measurements for this project were made by the meteorological unmanned mini aerial vehicle M^2AV (developed at the Technical University of Braunschweig). The M^2AV is capable of measuring the turbulent wind vector, temperature and humidity with high precision. The measurements were made in the convective boundary layer during a short field campaign at the measurement site of the German Meteorological Service, southeast of Berlin, with several flights between sun rise and sun set on 11 and 12 July, 2010. The lower part of the atmosphere was also probed by a 99 m high measurement tower. Two sonic anemometers were installed at the tower (southern direction) at 50 and 90 m height, which measured the turbulent temperature and the wind vector.

The talk will be focused on the following research questions:
- Can the path-averaged CT2 measured by the M^2AV at different heights be confirmed by point measurements of CT2 at a measurement tower?
- What is the variability of the temperature structure parameters along a flight-path above heterogeneous terrain typical for Central Europe?
- Can the CT2 height dependency found by Wyngaard et al (1971) be confirmed by the M^2AV measurements in a convective boundary layer?