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Atmospheric Measurement Techniques Discussions

Interactive comment on "Meteorological profiling of the lower troposphere using the research UAV "M²AV Carolo"" *by* S. Martin et al.

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This paper describes the potential of an instrumented unmanned aircraft for tropospheric profiling by comparing its boundary layer measurements with observations done at observatory of Lindenberg. The paper is well written and makes a good case (albeit based on one single event) that the aircraft can indeed make a good contribution to boundary layer research. I recommend publication.

A few remarks: An overview of the pro's and con's of existing ground-based techniques is given. It would be fair to do the same for the UAV.
Reply by the authors:
Pro's and con's of the UAV are given in the introduction and in section 2.1 where the

aircraft is described. Additionally, the following operation limitations of the UAV are included: Operation limitations of the M^2AV are due to wind speeds at the flight altitude. The aircraft can not be operated if the wind speed exceeds 10 m/s. The M^2AV is able to operate at night with permission of the local CAA (civil aviation authorities). Such missions were already performed in the nocturnal stable boundary layer in Majorca, Spain, but not published yet. Operation in precipitation is currently not possible since the M^2AV is not rainproof concerning the measurement electronics. Operation in clouds is currently not allowed by the CAA in automatic flight mode.

The description of systems in section 3.2 seems too detailed for this paper.
Reply by the authors:
The author believe the description of the systems used for comparison with the M^2AV data is necessary for the manuscript.

Differences between the observations from the ground and the UAV are sometimes 'explained' by referring to the difference in integration time. In case raw data is available, I would like to see a comparison of measurements with comparable integration time.
Reply by the authors:
The tower data are only available averaged over 10 minutes. The radiosonde data and the M^2AV data are not averaged at all and therefore represent raw data. The problem with these two systems is that they did not measure simultaneously at the same altitudes. These systems where also operated about 5 km apart from each other. Raw data of the sodar are available. The authors assume that using raw data would not help to get a better comparison because of the different measuring and sampling strategies of the systems: The UAV samples data continuously along the flight path, whereas one sodar run takes 15 seconds altogether (measurement of vr1, vr2, vr3, transformation of the coordinates, etc.). The wind information for different heights and the different wind components (u, v, w) are based on different measurement volumes. Wind direction and wind speed are calculated from the components u, v and w. Since u, v, w are not

constant during the sodar runs of 15 seconds, averaging over that time is necessary. Additionally, the sodar data are averaged for a vertical level of 20 m depth. Raw data of the wind profiler are available. But keeping in mind that the wind profiler is operated 5 km away from the place where the flights were performed raw data of the wind profiler would not result in more comparable data.

Interactive comment on Atmos. Meas. Tech. Discuss., 3, 5179, 2010.