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Atmospheric Measurement Techniques Discussions

Interactive comment on "The CopterSonde: An Insight into the Development of a Smart UAS for Atmospheric Boundary Layer Research" *by* Antonio R. Segales et al.

Anonymous Referee #2

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In the manuscript "The CopterSonde: An Insight into the Development of a Smart UAS for Atmospheric Boundary Layer Research" by A. R. Segales et al., the authors introduce the CopterSonde which has the ability to enhance scientific understanding of boundary layer processes by providing routine measurements of temperature, humidity, and wind. The authors describe the CopterSonde's autopilot system and how winds are derived from the platform, provide details on the calibration procedures, and present examples of its measurements from recent case studies. Overall, I find the manuscript to be well-written, and I am happy to see that the CopterSonde is capable of providing robust thermodynamic information. However, I have a few concerns, including about the CopterSonde's winds, which I discuss in more detail below. These

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Discussion paper

concerns and others need to be addressed before I can recommend publication in Atmospheric Measurement Techniques: 1. I would like to see a graph or two showing the calibration procedure used to determine the coefficients C0 and C1 when operating the CopterSonde next to a tower. What do you mean by a “representative range of conditions”? Does this include very low / nearly calm winds as well? 2. A couple of the figures need to be regenerated. Can you find a better picture to use for the inset images shown in Figure 2? In Figure 8, the CopterSonde’s measurements of temperature and dew point temperature were virtually indistinguishable from the rest of the figure. The hodograph also needs to be made larger in order to better distinguish the different features. 3. It is encouraging that the CopterSonde was operated at temperatures down to -20 °C during the ISOBAR field campaign without any significant negative impacts on performance. However, it is unclear what the purpose of Figure 9 is. What do we learn from a simple time-height plot of temperature? Were humidity and winds unavailable from the CopterSonde during ISOBAR? Can you comment on the interpolation procedure used for the temperatures shown here? 4. The CopterSonde shows a significant wind direction bias, particularly for low wind speeds. The CopterSonde’s wind directions are more than 100 degrees different from the rawinsonde’s observations in the lowest $\sim$150 m (c.f., Figure 10b). This needs to be addressed. Even around 750-950 m AGL there is also a non-trivial offset, on the order of 45 degrees, between the CopterSonde and rawinsonde’s wind directions. 5. Given the rich dataset available from the LAPSE-RATE field campaign, it would be helpful to show additional comparisons between the CopterSonde and other platforms to provide more fidelity in the wind speed and direction measurements obtained from the CopterSonde. How representative were the results from the one case shown in Figure 10a-10c? I suggest showing mean difference plots, with estimates of error, across a range of conditions from the LAPSE-RATE field campaign.

Minor comments: 1. Line 128: “achieved” misspelled 2. Line 349: “descent” misspelled

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