Replies to comments of Reviewer #2

Manuscript Title: Fiber optic distributed temperature sensing for the determination of the nocturnal atmospheric boundary layer height
Manuscript Number: AMTD-3-2723-2010

We thank the referee for his encouraging comments which helped to further clarify the manuscript. Our responses below address all of the reviewer's remarks and questions (italic) and corresponding modifications were made in the manuscript (as explained below):

R#2: *Page 2725, line 28/29: This sentence is not clear to me. Why has it been difficult to obtain synchronous profiles from tethered balloon observations?*
Reply: Tethered balloons systems are typically equipped with only one meteorological sensor at short distance underneath the balloon. This makes it impossible to measure a temperature profile at a specific moment. This has been explained in the manuscript as follows: "… it is impossible to obtain an instantaneous high resolution temperature profile from a tethered balloon system which typically carries only one sensor."

R#2: *Page 2726: Some more general information on the method would be helpful. In particular it should be briefly discussed what determines the spatial and temporal resolution.*
Reply: The spatial resolution of a DTS system is hardware constraint and depends on the laser pulse length and frequency, and the detector analysis speed. The temporal resolution is basically user specified and depends on the noise level acceptance. A longer integration time reduces the noise level by means of a longer sampling and averaging period. We included these sentences in section 1 for readers unfamiliar with DTS. However, we think that the physical principle and technical aspects of DTS have been sufficiently described in several previous publications (referenced in this manuscript) and repeated discussion would not add anything new to this manuscript.

R#2: *Page 2727, line 3: what is meant with 'o.d. 0.7g/m?*
Reply: 'o.d.' stands for 'outer diameter', and 0.7 g/m gives the specific cable mass. For clarification, we modified the manuscript accordingly.

R#2: *Page 2727, line 16: what determines the spatial resolution? Maybe also a reference should be given here.*
Reply: See our reply to comment #2.

R#2: *Page 2727, line 25: how is the response time determined? What is the trade-off between response time and signal to noise ratio (or temporal/spatial resolution)?*
Reply: The response time denotes the duration of the fiber cable to adjust to a step change in ambient air temperature, i.e. the time it takes until the fiber cable is in equilibrium with the modified new temperature. From the pre-calibration, we estimated this value to be between 1 and 2 min for our system, from which we conclude that an integration time of 5 minutes is largely sufficient and justified for night time applications. We emphasize that during daytime, the influence of short wave radiation may require an increase of the integration time (see comment of reviewer #1). These issues have been explained and added in section 2.

R#2: *Page 2729, line 18: According to the Beer-Lambert law the intensity should decrease exponentially (and not linear). Of course, dB is a logarithmic quantity. But one should be careful with the wording.*
Reply: We agree that the former wording was misleading. We replaced the sentence by the following one: "The signal intensity decreases along the cable at a constant rate of about 3 dB km^{-1}."

R#2: *Page 2729, line 19: indicate => indicates*
Reply: Corrected.

R#2: *Page 2731, eq. 1: it seems that there is an error in this equation. Maybe there is a 'delta' missing at the left side?*
Reply: There was indeed a 'Delta' missing on the left hand side of Eq. 1. This has been fixed in the revised paper.