Interactive comment on "Technical note: using Distributed Temperature Sensing for Bowen ratio evaporation measurements" *by* Bart Schilperoort et al.

Anonymous Referee #2

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General comments:

The idea of vertically-resolved temperature and humidity measurements using DTS is very nice, and with some technical and conceptual adjustments such an approach is likely to improve near-surface flux measurements. However, I find that the present study falls short in bringing to bear the main advantages that full profiles could offer and at the end, the measurements are reduced to invoking the standard logarithmic profiles followed by extensive averaging to remove "noise" that, in fact, could offer the most interesting new insights into the fluxes of interest... I found the comparison with EC measurements a bit weak and contributing to the ambiguity in the value of the

new method (e.g., the comparisons made by Euser et al. 2014 including Surface layer scintillometer were somewhat more definitive). In order for such a new method to gain traction, it is imperative (in my view) that the method is tested over as simple surfaces as possible such as water surfaces or a flat land surface after irrigation and follow drying, etc. to remove as much as possible confounding effects of canopy and other aerodynamic masking effects. Alternatively, the authors should convincingly show how this new DTS profiler performs better than simple two point measurements routinely done by standard BR stations.

Specific comments:

p 3 l 5: it is unclear how eqs. 2 and 3 were implemented with the continuous temperature and vapor pressure profiles (unlike the standard 2 points of classical BR)?

p 5 l 20: how was the thermal energy input by the water supply considered in the DTS measurement?

p 8 l 10: I fail to see the value of using a DTS profile if at the end one invokes a logarithmic profile (an assumption) to fit to a subset of the data for inference of the real temperature and humidity profiles.

I don't understand the basis for Flag 1 (eq. 20) – why should the instantaneous vapor pressure gradient always fit a logarithmic profile (such a profile is a product of significant averaging in the first place).

I understand the origins in the MOST assumptions, but these are supposed to be direct measurements that reflect what occurs in the profile. I would expect far more information from the fluctuations than this conformity to the "standard" MOST assumptions. What is the need for a profiler if one assumes a logarithmic profile and then fits it to 2 points?

p 12 l 15: just stating that the fetch were no equal is incomplete, what does this mean? what was done with this information? The setup leaves too many ambiguities in both

the BR and the EC (considering energy closure and other mismatch issues)

A few general technical comments:

- I also wonder about the fundamentals of the measurement itself: (1) the boundary conditions for the wet bulb mass exchange (summarized in the psychrometric constant in eq. 10) are different at 0 and 40 m (the boundary layer around the wet and dry DTS cables due to different wind speed and other factors). This is somewhat related to the comment in page 12 line 10 but not only for the turbulent transfer of the two quantities heat and vapor in the air, but also for the inferences made at the two locations say 0 and 40 m regarding the wet bulb temperature (it is a bit subtle, I admit. . .). It is possible that the psychrometric "constant" which we take for granted as being constant, is different at the two elevations, because the evaporative cooling behaves differently (I am not even entering into the question if the resistance to vapor transport from cloth is important or not). Hence, separating the Bowen ratio estimate to two independent profiles for vapor and temperature may not necessarily be a good idea. . . (I don't know for sure, I simple raise a possible issue that you have listed as an "advantage")

- I think that you need to resolve the issue of water input energy to the system – for example, by applying a pulse of water during which you don't measure and then, after liquid and energy relaxation, you may measure with confidence the entire profile without the water supply "holes" you now have

- An important and potentially interesting feature of the proposed method is to capitalize on the observed profiles and deduce how fluxes and near surface interactions actually work