Responses to Referee #1

The manuscript is very well written, and provides a focused and well justified description of an improved approach for footprint modeling.

Many thanks.

I have several minor comments (listed below), regarding reference to recent publications that have used footprint models, and regarding the order and flow at which the formulation is described.
I salute the fact that a link to the code is provided with the manuscript. I think this should be moved to an earlier point in the paper (perhaps just after the introduction) and not hidden past all the appendices, but this is just my preference and I will accept the authors preference for the placement of the "code availability" section. However, I checked the website listed and the source code is not provided there. There is only a link to an online version of the model, which is a far cry from the code itself. I assume that a link to the code will be posted when the paper is accepted, but the editor should verify this before the final posting of the manuscript.

Indeed, we await the acceptance of the paper before the new webpage with the model code goes live. We also plan to upload the footprint code as supplement to this paper.
Thanks for the suggestion, we now do mention the availability of the code at an earlier point in the paper (end of Introduction).

P6759 Line 16- Matheny et al 2104 JGR 119:2292-2311 and Morin et al JGR 2014 119:2188–2208 are two additional example for novel applications of a 2-D footprint model, for scaling the contribution to flux measurements from a disturbance area and for gap-filling of CO2 and methane fluxes from a heterogeneous wetland site. Morin et al is also provides a relevant for Page 6761 Line 5, and for remote-sensing driven footprint climatology (see Morin's figure A1) discussed in page 6775, lines 15-20.

Many thanks for the above references. We want to stress that the articles listed in our manuscript are by far not exhaustive. As footprint modelling has become an established approach in the FLUXNET community, it is beyond the scope of this manuscript to list all articles dealing with such. We hence refrain from adding these additional references.

Page 6762 Line 8-10: What happens in airborne measurements? The vertical reference cannot be assumed as fixed there. Upon further reading, the topic of footprint for moving measurements, such as airborne flux measurements, is not addressed at all. I recommend removing the comment about airborne measurements in Page 6760 Line 8 as it is creates a false expectation that the solution you are about to present can handle these as well.

Recent research has shown that footprint models can be applied to airborne flux measurements. We refer to according studies from, for example, Hutjes et al. (2010), Kustas et al. (2006), Mauder et al. (2008) and Metzger et al. (2012, 2013). These articles are listed in our manuscript as examples for such approaches. Adding details on the processing of airborne flux measurements is beyond the scope of this manuscript.

Page 6762 – the formulation here tells us about the footprint function, but does not tell what it actually is. We end up with a symbolic representation of a footprint function (eq. 3). Took me a while to figure out where you are going with it and to get to the solution. Can you add a few words here to the effect that later in the manuscript you will derive the parameterized forms for D and (fˆy)bar.

Many thanks for this suggestion. We have included the following sentences after Eq. (3) on page 6762 to clarify the aim of the parameterisation: "In the following sections, we present a scaling approach and a parameterisation for the derivation of (f^y)bar and D_y with the aim of simple and accessible estimation of f(x,y)."

Page 6772 – at some point around equation 13 I ran out of patience and started going over all the equations looking for a formulation of (fˆy)bar and sigma_y , which are the key to solving the footprint function (eq 10). After a somewhat frustrating quest, I finally found it, way later, on page 6772, hidden in the numerical recipe of example 5.2, and not strictly formulated (the reader is instructed to invert equations 8 or 9 and 13). I admit that my jumpy reading style and short attention span should not be considered the norm or burden the authors, but would it be possible to write the inverted forms of eq9 (or eq8) and eq13 (i.e. (fˆy)bar = . . . and sigma_y = . . .) at an earlier point, and say that they could be solved and substituted in eq10 to find the footprint function, provided empirical formulations for sigma_y* and Fˆy*. I think the end of section 3 would be a suitable spot for this, as it will provide a logical transition to the parameterization in section 4.

The structure of the manuscript is as follows: 1) real scale footprint data set, 2) scaling approach to be applied to footprint data, 3) parameterisation of scaled footprints, 4) derivation of real scaled footprints based on the parameterisation. We think that introducing an inversion of the scaling in between rather than at the end would be confusing. Nevertheless, we added a short explanation of the steps in Section 2 (see above) and hope this helps to clarify the approach.

Page 6777 Line 7 – See nice example of a flux tower-based study of the roughness parameters in a forest site in Maurer et al 2013 AFM.

Many thanks, very interesting study. We added a reference to Maurer et al. in Section 5.4.

Page 6777 lines 9-12 – the letter h is often associated with canopy height and not always with boundary layer height as in this paper. As it is mentioned immediately after z_0 (which is a function of canopy height) it confused me. Please move the explicit definition of h to this point, to prevent confusion, i.e. "Measurements of the boundary layer height, h, are available only rarely. . ." (it is currently about 5 lines later, in "a small variation in the input value of the boundary layer height, h . . .")

We have changed the sentences as suggested by the referee (Section 6.1).

References

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Mauder, M., Desjardins, R. L., and MacPherson, I.: Creating Surface Flux Maps from Airborne Measurements: Application to the Mackenzie Area GEWEX Study MAGS 1999, Bound.-Lay. Meteorol., 129, 431–450, 2008.

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