Responses to Referee #2

The authors state that “the aim of the present study is not to present a new footprint model, but to provide a simple and easily accessible parameterisation or “short-cut” for the much more sophisticated, but highly resource intensive, model”. The aim is very much welcome and invaluable for the community carrying eddy covariance flux measurements, and the paper fulfils the aim. The paper is written and structured very clearly and is “user-friendly” and I have only few minor comments and recommend its acceptance after the comments are concerned.

Many thanks!

1. p. 6758 (Abstract), line 5: the sentence can be interpreted that single site flux gives information at sub-ecosystem scale and upscaling to ecosystem scale is needed. However, it is commonly thought that eddy covariance is operating, almost by definition, at ecosystem scale (or neighbourhood scale if urban surface). Can you clarify?

We agree that ideally, a flux tower does provide information on the ecosystem scale (which in reality is not always met). To clarify, we changed the wording in the abstract and replaced 'ecosystem scale' by 'local scale'.

2. p. 6760, line 25: there is a very recent article on footprints and LES: Hellsten et al., Footprint evaluation for flux and concentration measurements for an urban-like canopy with coupled Lagrangian stochastic and large-eddy simulation models. Boundary-Layer Met. DOI 10.1007/s10546-015-0062-4, 2015. Note that I am not asking you to necessarily refer to this article but mentioning it just for your notice.

Many thanks. As we haven't mentioned so far the footprint approach using a combination of LES and LS, we added the above reference and an additional paper to fill this gap in the Introduction.

3. P. 6764, line 26: from where the value for the zero-plane displacement height is obtained? It is maybe mentioned somewhere but it would be good to say/explain it here.

We assume the referee refers to p. 6763 (there is no line 26 on p. 6764). For the simulations of LPDM-B of Section 2, only z_m is of interest, as the model does not include the roughness sublayer. For footprint estimates of 'real' receptors mounted at z_receptor on a flux tower, the zero-plane displacement height, z_d, is needed for derivation of z_m. We added a couple of sentences on the possible derivation of d in Section 5.4, where real-scale flux footprints are discussed.

4. It would be good to have a section called “Results”; Does it include sub-sections in Section 3 or only 4 and/or 5? The present titles of the sections can be kept but they would be below Results.

This is a tricky request. As we developed a novel scaling approach, a new parameterisation, and a new approach for fast and simple real-scale footprint estimates, it is not really obvious which sections would be part of a Results section. We hence prefer to leave the structure as it is.

5. Table 1 and other relevant places: Measurement heights within the roughness sublayer (RSL) are disregarded. However, in reality, many flux measurements are in fact carried within RSL, although the (strict) recommendations are against it. I am not asking you to do anything right now for the paper but by raising this issue I would welcome the continuation of your work to include also RSL effects. Do you know to which direction the omission of RSL is leading? If someone is using your parameterisation for RSL measurements, is there overestimation or underestimation of the extension of the footprint?

The referee raises an important question. In fact, the inclusion of RSL is part of current work of the authors.

6. Table 4: why for neutral cases the value of R for the standard deviation is much lower (0.37) compared to other cases?

Many thanks – we managed to improve the performance metrics for the neutral scenarios by adjusting the proportionality factor ps2 to 0.35. The metrics in Tab. 3 and Tab. 4 were adjusted accordingly.

7. Fig. 5: The measurement (receptor) height is only 12m, as far as I know the tree height at Norunda is higher. Please, clarify. In addition, the background map is said to be tree height, but no scale is given.

For Figure 5, we used measurements at 33 m above ground. However, note that throughout the manuscript, we set $z_m = z_{receptor} - z_d$, hence with $z_d = 21$ m, we get $z_m = 12$ m. We added this information to the figure captions to omit confusion.

8. General comment: I am not asking you to do anything right now for the paper but by raising this issue I would welcome the continuation of your work to calculate also concentration footprints. They would be valuable for tall tower absolute concentration measurements, but I am not sure how you could deal with advection/long-distance transport.

Yes, we agree, this is an important issue and again, it is part of current work of the authors.