Review of "Application of flux footprint equations from Kljun et al. (2015) to field eddy-

covariance systems for footprint characteristics into flux network datasets" in Geoscientific Model Development (GMD) by Zhou et al.

General

The submission "Application of flux footprint equations from Kljun et al. (2015) to field eddy-

covariance systems for footprint characteristics into flux network datasets" is in my opionion a suitable entry for the journal Geoscientific Model Development (GMD). The article in questions goes to great lengths explaining the need and way to make all variables dimensionless for a online flux footprint calculation on a datalogger, based primarily on the well-known footprint from Kljun et al. (2015) that allows for rather direct calculation of footprint percentages (like 70/80/90%) and the percentage for an fetch of interest. Additionally, they provide the code for a specific logger, describe the derivation of the (critical) boundary layer height that is quite necessary for the footprint calculation. The explanations are succint and and targetet, adding also the potential analysis of measurement height for a specific region of interest / annulus around the station.

I recommend publication after fixing the minor comments and discussion of the major comments, the latter with a focus on making the code more easily accessible and complete via a github repo and the discussion of especially an additiona for the realistic usage in a flux network with direct data submission.

Major Comment(s)

C1 (usability and uptake of code): As this article focuses on the use of the footprint for dataloggers in the field and has an author from CSI, I would recommend that CSI (or ChinaFlux etc.) open a github/gitlab repository that does not only contain the CR6 code but also a CR1000X version. This would allow for easier use (rather than copy paste the appendix code) and allow for future adjustments (such as new loggers)

C2 (completeness of code): Similarily, a ceilometer might not be available (as noted in the article itself too, e.g. section 4.4) and thus the boundary layer height h has to be estimated. To facilitate uptake, these functions (not "just" the equations) should be included in the logger program (with a proper comment noting that h may be replaced by the actual measurement if available in the measurement setting.

C3 (realistic usage): How to the authors rate the usefulness for automatic handling in flux networks as usually other device than data loggers are available, which are usually capable of handling more computational intensive task, i.e. won't the initial calculation (as there is the limit of integration) be used as first estimate only and then be replaced later during post-processing? At least to my knowledge that is the typical approach.

C4 (understanding of integration requiment): Based on the example in section 3.2.3, it appears that the first term can be used as its pre-calculcated to 32.52.. %. Would it not be easier to have a fixed lookup table in the logger program which holds 100 or 1000 values (or up to 70% in 1% steps, then 0.1% or better) giving a resolution of 0.1% instead of integrating? Based on typical

land cover/land usage (1/m10m or coarser), would this not suffice (also with C3) in mind, also to retrieve *FP_FETCH_INTRST*? This is noted on L558-L564 by the authors as well.

Minor Comment(s)

L113-114: "Each datalogger operates a program from the EasyFlux series, which handles instructions for system control, field measurements, and data transfers (e.g., to FTP site or Campbell Cloud)" → While it is certainly true that many do, I find it hard to believe that all do (and I know of some that do not). Hence rephrase as "Many .. operate a …"

L133: The 80%@270km is a rather extreme example, it would be useful to give then also the lower bound and the typical size and to what z_m this relates to.

L259 – 261: This is a bit unclear to me. Typically this is given as a constant ("entered into the field ED flux system") rather than calculcated inside the system as the canopies are usually not know by the logger system.

L533-539 and Fig4: It should be noted here that installation in the field is hardly ever accurate to cm height, simply as hardware material might be different and attachment beams might vary slightly. But this is not an issue based on Fig4 as (given the scenario) even the range 5 to 6.5 m (1.5 m) still gives above 84% footprint within the area of interest.

L553-L555: I'm not sure I agree with this, as even with automatic quality checking, turbulent fluxes are often still subject to some issues (of course depending on the specific location), but given that

L725-L860: Please remove the sections (while they help to understand, they should be in the form of code comments as this allows easier use in an existing system. See also C1

Typos/Editorial suggestions

L59: The greater the footprint value, the more contribution from that location. → The greater the footprint value, the higher the contribution from that location.

Fig1: Wiggly line under central CO2 text molecule in sonic indicating unknown word should be removed and "throught the ECMV" is half a line below the first part of the text in the legend
L129: Remove "the"
Fig4: "arodynamic" → Aerodynamic
L134: manifests → demonstrates
L135: at field scales → at all possible field scales | of the dimensions → of the spatial dimensions
L139/L143 the symbol for the buckinham analysis is not the same, please unify
L147: f(x,y) .. → f(x,y) = …
L164: overbarU(z) looks a bit weird (in terms of font). Check if its correct.
L192: eddy0covariance → eddy covariance
L218: Typesetting of equaton 18 appears a bit weird
L263: "user onto" → "user into" | "before or while" → during setup or when an updated value is suitable
L265: cumulative → summed up (to me cumulative implies a vector still but this will be the sum/total)
L320: overbbar U(5) again looks a bit weird.
L335: overbbar U(5) again looks a bit weird. Also in some other places, please check all.
L355: p>= 32.53%looks a bit weird.

Supplementary