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Interactive comment on "Quantifying the impact of emission outbursts and non-stationary flow on eddy covariance CH_4 flux measurements using wavelet techniques" *by* Mathias Göckede et al.

Gil Bohrer (Referee)

bohrer.17@osu.edu

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The manuscript studies a very relevant and much discussed problem - the challenge to methane flux measurements, given the high importance of "hot moments" and strong flux bursts. The analysis methods they use are robust and innovative, and the conclusions, particularly with regard to uncertainty and evaluation of different empirical approaches methane flux modeling (gap-filling) are very relevant and interesting.

I have a few minor comments: Introduction- P2. L5-15 You discuss ebullition as the major (and only one discussed) source of flux peaks. This may be the case, but I argue (with much support from observations by my group and others) that the spatial hetero-

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Discussion paper

geneity of methane fluxes can be interpreted as bursts and peaks when observed by the tower. For example, if there is a small patch that for whatever reason emits 2X or 5X more flux than the surrounding area, a small movement of the footprint to overlap more with that patch will read as a strong peak in emissions. I think most of what you define later as cluster events are driven by this spatial heterogeneity and not bubbling. That is very typical in wetlands, even within what would otherwise be considered a homogeneous land-cover type. Please discuss spatial heterogeneity as a source of flux spikes, not only temporal bursts.

P2.L30-35 Xu, Metzger and Desai 2017 AFM used wavelet flux calculation as the foundation for their "Upscaling tower-observed turbulent exchange at fine spatio-temporal resolution". Please check out what they did. It will make sense to reference that study here, but there are many parallel between their study and yours that should be acknowledged, some would fit later in the discussion.

Table 1 - the code in the table are meaningless outside the software package you used for flux processing. Can you provide equivalent physical ranges of something (standard deviation, thresholds to exceedance, % different before-after for stationarity ...) that will define these code and will make the table more meaningful? These codes define the analysis. Will be very important to define them using real-world (physical or statistical) conditions.

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