Earth Syst. Sci. Data Discuss., referee comment RC1
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Comment on essd-2020-307

Anonymous Referee #1

Referee comment on "FLUXNET-CH_4: a global, multi-ecosystem dataset and analysis of methane seasonality from freshwater wetlands " by Kyle B. Delwiche et al., Earth Syst. Sci. Data Discuss., https://doi.org/10.5194/essd-2020-307-RC1, 2021

The FLUXNET-CH4 dataset includes eddy covariance methane fluxes along with CO2 fluxes and associated meteorological and site factors from 79 globally-distributed field sites. The manuscript is a well written and detailed description of the dataset and also includes preliminary analyses of seasonal patterns, site representativeness, and important summary information about the dataset. The methods used to develop and process the dataset are considered reliable and well tested within the eddy covariance field and are clearly described. The data appears to be high quality. This dataset will be highly useful for future modeling, synthesis, and process-oriented studies focused on ecosystem methane fluxes and how they vary over space and time. The dataset is freely accessible, although users must register on the FLUXNET web site. The data access interface is somewhat inefficient when downloading data for a larger number of sites (it requires clicking a link for each site individually, or installing a third-party downloading plugin). The option to download all sites as a single compressed file might facilitate easier access for projects that use many sites such as cross-site syntheses.

The manuscript includes quite a bit of interesting analysis of seasonal patterns across sites and how they vary with latitude and mean annual temperature. While these analyses are certainly interesting and valuable, I'm not sure if they fit entirely within the aims and scope of ESSD, which states "Any interpretation of data is outside the scope of regular articles." (https://www.earth-system-science-data.net/about/aims_and_scope.html).

Overall, I think this is a very valuable dataset and a high quality description paper. I have some specific comments about the manuscript that could help improve the clarity of some aspects:

Line 304-305: From the download interface, it appears that some sites are available as Fluxnet Tier 2, not as CC BY 4.0. So the statement that all site data are available under CC BY 4.0 is not completely true.

Line 312-313: Is there a more precise definition for "relatively shallow water table"? Was a specific cutoff depth used?

Line 316: Is there a more precise taxonomic or ecological description for "brown mosses"? This seems like a vague term and is not described in the cited Treat et al (2018) paper.

Line 323: To be precise, Table B3 includes citations to the climatic data, not the data itself

Line 327: Table B7 includes annual methane flux and uncertainty, specifically. Referring to "flux" is ambiguous because the dataset includes methane, CO2, and energy fluxes.

Line 330: Section 2.1.4 should specify that it refers to annual CH4 fluxes to avoid confusion since the dataset also includes CO2 and energy fluxes.

Line 340-341: Some more explanation would be helpful. It wasn't immediately clear to me what this meant. Specifically, the site has one year of data that goes across two calendar years, so both years were listed separately but with the same annual flux value in the table.

Line 354: It's not clear which global gridded datasets are being referred to here. Datasets of what? Salinity? Wetland area? Or something else?

Line 422: It's not clear what the "range" is referring to. Does this mean annual averages? Is the range referring to the different variables that were used, or to different values?

Figure 3: Many of the dots overlap. It would be easier to distinguish sites if the dots were smaller or transparent.

Line 559: "a site in Botswana": The site code should be provided here

Line 565: "The size of wetland points are made larger": All the points are the same size so it's not clear what this means.

Line 566: Not all points are labeled with site codes. Was this just for ease of visualization?

Or did some other factor go into the choice of which to label?

Does density of land pixels (gray colors) have meaningful units that can be provided for this figure? Or is it purely qualitative? If it is quantitative, a color bar should be provided for the gray shading. Is the amount of area covered by gray shaded regions quantitatively meaningful?

Line 599-600: The suggestion of regions that could improve data coverage is useful. Can a citation be provided to support the statement that these regions are high CH4 emitting? Since they are not included in this dataset, there must be some outside data or publications estimating fluxes from those regions that this statement is referring to.

Figure 8: A legend should be added to the figure labeling the different line colors. Also, it is best to avoid using red and green colors as the only distinguishing factor in graphics because red/green colorblindness is quite common and would make this figure difficult to interpret. Use of red/green colors is an issue on several of the figures (9, 10, 11, 12). This could be addressed by using a colorblind-friendly color scheme, or by using different symbols or line styles in addition to different colors.

Line 652: What does the yellow line show?

Line 665-666: This phrasing is confusing. What are these months being added to? I guess this refers to integrating over the time period from September-May instead of October-March. But isn't it obvious that including more months would give higher total fluxes? This would always be true unless fluxes were zero or negative in some months.

Line 706: Does the confidence interval 31 +/- 40 days mean that the lag was not significantly different from zero?