

## ***Interactive comment on “Representing methane emissions from wet tropical forest soils using microbial functional groups constrained by soil diffusivity” by Debjani Sihi et al.***

### **Anonymous Referee #3**

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The manuscript of Debjani Sihi and colleagues brings up a very interesting topic on disentangling gross methane emission and uptake from wet tropical forest soil using a combination of microbial functional group CH<sub>4</sub> model and a diffusivity module. This work clearly shows how landscape topography and climate affect net CH<sub>4</sub> emissions due to shift of substrate production, soil redox conditions, and diffusivity of O<sub>2</sub>, H<sub>2</sub>, and acetate under drought and recovery phases. The experimental work is well performed, convincing and well discussed in the context of previous literature. The manuscript is well organized and clearly written and I enjoyed reading it. I only have a few comments that should be addressed: Line 54 Should it be “increased consumption of atmospheric CH<sub>4</sub>”? Line 258 The correlation seems stronger and more negative in 2015 (-0.36)

C1

than 2016 (-0.61). Line 321-322 You defined pre-drought period from DOY 57-115 instead of DOY 200. The details in results should be checked. Fig. 1 I appreciate the conceptual figures herein, but it looks a bit confusion and I do not well understand what means in panel a. How to relate microsite frequency with soil properties? Do substrate concentration, soil moisture, diffusivity of solute and gas present the similar pattern for one kind of microsite? Why this figure links to Eq.13? Also in panel b, it would be more clear for readers if you could adjust it to a better shape or based on the clue of the present study. Can you try to improve the conceptual figure and clarify this in the legend? Fig.3 and 4 The label of y-axis for soil moisture and oxygen should be between 0-1 rather than 0-100, as the unit is V V<sup>-1</sup>. Otherwise, the unit should change to %. Fig.4 and 6 The unit of CH<sub>4</sub> emission should be uniform. Some of them are nmol m<sup>-2</sup> S<sup>-1</sup>, while others are nmole m<sup>-2</sup> S<sup>-1</sup>. Also the unit of acetate (Fig. 2).

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C2