

Answer to Referee #1, Lucietta Martorano

We wish to thank the referee #1, Lucietta Martorano, for her time and care in providing comments on our manuscript. We provide detailed answers below (answers are in bold) as well as a modified version of the manuscript (see suppl. document):

Thank you for the invitation to review the text Dr. Ringeval and everyone.

It is known that in wetlands occurs that large amounts of dissolved organic carbon and particulates are transported to other aquatic and terrestrial ecosystems, the process of flood and drought in the floodplains of the Amazon and its tributaries.

To evaluate the order of magnitude is worth noting: Richey et al. (2002) estimated the CO₂ emissions of all Amazonian floodplains as 0.5 Gt C yr⁻¹. Melack et al. (2004) estimated methane emissions from wetlands in the Amazon 22 Tg C yr⁻¹, much smaller than the flow of CO₂. However, for the thermal potential of methane, this flow has a power of atmospheric warming equivalent to 0.2 Gt C yr⁻¹ CO₂.

We agree with the reviewer. However, our study is totally devoted to CH₄ and we think that adding a sentence on the CO₂ vs. CH₄ climate footprint of wetlands will make the introduction less clear. Moreover, although similar in radiative forcing, the relative contribution of floodplains to the CO₂ budget is much less than their contribution to the CH₄ budget.

Regarding the document made the following suggestions:

1. Figures are out of editorial standards. Subtitles without standardization, see Figures 1, 8, 9 and 10.. The units do not follow the rules of the International System (IS), for example, KgCm-2yr-1

Figure 1 and 9 show fraction of total grid-cell at 0.5 degree resolution covered by floodplain. The floodplain fraction is unitless and we added this information to the revised version of the manuscript. The units of Figures 8 (mgCH₄.d⁻¹.m⁻² of wetland) and 9 (gCH₄.month⁻¹.m⁻² of grid-cell) are given more clearly .

2. Reinforcing the need to give all citations in the text. - for example, Belger et al., 2001 and Keller et al., 1990, cited in Table 2.

We agree with the reviewer and gave all citations corresponding to the measures on sites in the main text of the revised version of the manuscript. Reference list has been updated.

3. There is much repeated quote in the text.

In the revised version of the manuscript, we carefully reduced the repetitions.

4. I suggest that you use the term evaporation process and not “Ebullition”

Despite the cited author Zürcher et al. (2013) in Impact of an abrupt cooling event on interglacial methane emissions..., but the process in itself is connected evaporation or evapotranspiration rates, agitation of molecules by heating, but it is not “Ebullition”, but the mass and energy transport in aerenchyma level to atmosphere.

We think there was confusion between ebullition and the plant-mediated transport. We clarified this by adding a sentence at p16723, L5 in the revised version of the manuscript :

“Thus, as in Wania et al. (2010), a total of three transport processes is accounted for: diffusion, plant-mediated transport and ebullition.”

The so-called plant-mediated transport corresponds to gases transported through aerenchyma. Gases either follow a diffusion gradient or are actively pumped upwards. Wania et al. (2010) considered only the passive flux of methane and carbon dioxide through plants as it is the most dominant form of gas transport (Cronk and Fennessy, 2001). The formation of bubbles (the so-called « ebullition » process) occurs when the partial pressure of all gases surpasses maximum solubility. The term 'ebullition' is used when dealing with wetland CH₄ emissions (e.g. Walter et al., JGR, 2001 ; Grant and Roulet, GBC, 2002 ; Melton et al., 2013, Biogeosciences).