Dear reviewer/editor:

We ssincerely appreciate your suggestions and help on this paper. We are pleased that the reviewers saw merit in our paper, and recognised the importance of this relatively new line of work. We read their comments with great interest, and we have managed to complete an extensive revision on time. We thank them for their efforts.

According to the two interactive comments, major revision of the manuscript is listed below:

Revision of introduction

1. The new introduction is more focused on the necessity of work on reservoirs, especially on the littoral zone. Limitations of previous work in the littoral zone were discussed as well as the unique contribution of this work. We have deleted some of the more general material about climate change.
2. We have refined the hypothesis and objectives, spelling them out more clearly and accurately.

Revision of methods

3. We have clarified several items in the 'methods' which the reviewers queried.
4. We have revised the description of statistical methods including some new analysis.

Revision of results

5. We have carried out more statistical analysis, and in particular we have looked at the negative fluxes as well as the overall fluxes, and tried to relate them to environmental variables.
6. Diurnal variation of the flux was added. This demonstrates that the diurnal variation is small.
7. Fig1, 2, 3, 5 was kept as before but improved in some specific details.
8. Fig 4 was replace by a new figure which showed not just flux variation among water levels, but also variation among months and times of day. Furthermore, the new Fig 4 also showed differences between 'natural land' and farmland (which could explain why emission of all sampling plot 'C' looks higher).
9. Fig 6 was improved by including negative fluxes. The relationship between flux and DO was plotted separately as a new Fig 7 which showed better correlations. Relationships between flux and wind was not included anymore as the correlation is very low.
10. Details of plant species found in the littoral zone during each month are listed as a table.
11. Multi-ANOVA was done to show flux variations according to the factors: location, time of year and time of day. Location and time of year are strongly significant, time of day is not.
12. The correlation at natural land and farmland between flux and environmental factors was added.

Revision of discussion

13. The discussion was improved, both in logic and structure. New references were added. 50% of the text was rewritten according to the comments.
14. Discussion on flux from natural land and farmland of the present study was added.
15. A brief conclusion paragraph was added at the end answering the objectives and addressing the important hypothesis raised in the introduction.

For one-to-one response to each comment, see below please.

Anonymous Referee #2

This manuscript discusses a detailed field study on N2O emissions in the littoral zone (which they define as from non-flooded to permanently inundated waters) of a large Chinese reservoir. They describe the sampling design well and included 7 campaigns throughout various seasons, including the flooding season which is most important to their study. They compare their results of N2O fluxes and its controls to a similar study on CH4 fluxes at the same reservoir. The detail of experimental/sampling setup makes this study relatively unique as does the comparison of N2O to CH4 fluxes in the same area of a reservoir. The focus on greenhouse gas emissions from seasonally inundated regions of a reservoir is an extremely important topic. While I do have some issues with data interpretation and the discussion (but include ways how to improve it), I believe after some major revision that this paper could be accepted for publication.

General comments:

1. My biggest concern with the manuscript is their definition of the littoral zone. From what I can gather, the authors included an area next to the lake that is never flooded (Site NF) in their analyses (in Table 1, for example). The littoral zone of a lake is the nearest to shore portion of a lake that is underwater. In the case of a reservoir, where water levels can change dramatically, I would think the definition of a littoral zone could be robust enough to include the drawdown region of the reservoir where changing water levels will leave a portion of the littoral zone seasonally dry. However, I find it hard to call a portion of the lake that is never inundated as part of the littoral zone. I thus find it strange to include measurements from such an area in regressions between flux from the littoral zone and the environmental parameters considered. The fact that Figure 5d (site NF) is a completely different scale to the other three panels containing the other three sites is enough of a reason to cause concern when including this site in your correlations. If by chance I misunderstood and site NF was not considered in the correlations, then I believe the authors should make that very explicit. However, if this site was included in the correlations then I strongly suggest that the authors re-do their analyses without these measurements. I also have an issue with the soil analyses and using site DW with the others. See comments below too.

R: Site NF is seldom flooded (one time per several years) and not flooded during our sampling campaigns. More explaination was added in 'method'. The correlations at each water level is shown below, disscussion on differences among water levels is now added.

Spearman's Rank Correlation (r) between flux and environmental variables.

		Wind speed	Air temp	Water depth	SWC	Water DO	Biomass	Bulk density	Soil pH	Soil TC	Soil TN	Soil NH_4^+	Soil NO_3^-
Farmland and non-farmland	All site	0.14*	0.19**	-0.02	-0.12*	0.35**	-0.08	0	0.08	-0.04	0.03	0.01	0.25**
	DW	0.45**	0.41**	0.40**	0	0.32**	-0.35**	-0.02	0.25*	-0.34**	-0.34**	0.01	0.24*
	SW	0	0.38**	0.19	0	0.11	-0.12	0.09	-0.06	0.12	0.12	0.08	-0.13
	SF	-0.13	-0.06	-0.1	-0.23	0.23	-0.11	-0.03	0.03	-0.04	0.16	0.23	0.11
	SFC	-0.01	0.15	0.2	0.28	No data	-0.27	-0.09	0.08	0.15	0.08	-0.23	-0.03
	NF	0.21	0.18	0.35**	0.32*	No data	0.04	-0.41**	0.29*	0.27*	0.33**	0.2	0.48**
Farmland	All farmlands	-0.01	0.38**	-0.11	-0.04	0.14	0.11	0.13	0.19	-0.08	-0.06	0.03	0.25*
	SW-C	-0.19	0.57**	0.39	0	0.09	0.12	0.18	-0.04	-0.18	-0.18	-0.04	-0.08

	SF-C	-0.37	-0.12	0.03	-0.17	-0.43	0.38	-0.03	0.03	0.08	0.08	-0.09	0.09
	SFC-C	0.12	0.77**	0.72**	0.75**	No data	-0.73**	0.24	-0.24	-0.11	-0.11	0.11	-0.24
	NF-C	0.12	0.61**	0.09	0.54*	No data	0.09	0.03	0.02	0.05	0.11	-0.22	-0.22
Non-farmland	All non-farmlands	0.18**	0.14*	0.1	-0.11	0.42**	-0.14*	-0.09	0.02	0.11	0.13*	-0.14*	0.21**
	SW-A, B	0.08	0.38**	0.13	0	0.09	-0.13	0	-0.07	0.25	0.2	0.14	-0.03
	SF-A, B	-0.09	0.06	-0.24	-0.38*	-0.15	-0.18	-0.02	0.07	0.07	0.07	0.31*	0.11
	SFC-A, B	-0.11	-0.12	-0.05	0.15	No data	0	-0.33	0.03	0.24	0.07	-0.75**	0.05
	NF-A, B	0.22	-0.14	0.29*	-0.01	No data	0.1	-0.11	0.30*	-0.2	-0.2	-0.11	0.34*

N is from 12 to 324.

2. There were many times in the discussion that I felt the authors skipped details crucial to understanding their line of thinking. Please take special note of those when implementing my comments below.

R: The discussion has been rewritten. We think the revised text is better in logic, as well as in its information content.

3. There is an incredible amount of data in this study and I believe the authors have not drawn as much out of the data as they could and should. Their 24-hr measurements are impressive as not many researchers spend the time to perform flux measurements every 3 or so hours. I highly encourage the authors to go into more detail regarding temporal variability in their data, while taking care about the spatial variability and not to compare apples to oranges.

R: A graph of diurnal variation is now added. The variation at different times of day was not significant even when the analysis was done seperately at each water level. No good correlation was found between diurnal flux and environmental factors (temperature and wind speed was measured at the same time and frequency as diel flux). So, to summarise the pattern of variation, just one line plot and the ANOVA is shown in the revised manuscript.

4. I believe the paper could benefit from some type of summary/conclusion paragraph. This will also help the authors find their focus in regards to the main findings/results of this study.

R: One paragraph was added at the end summarising the objectives and hypothesis raised in introduction.

Specific comments:

Abstract:

1. Line 7-9: Don't use the word 'area' so much when describing the five sampling locations.

R: Deleted.

2. Line 19 – were N2O and CH4 measurements made at the exact same time?

R: Yes, the N_2O and CH_4 measurements were made at the exact same time. It was specified in abstract.

Why only comparable methods? I would be clear in the abstract but not give too much detail. For example, ': : :compared with a previously published study of CH4 emissions from the same sites as those in this study which was carried out simultaneously.'

R: Thank you! Revised accordingly.

Introduction:

1. P5335, L4 – list some of the man-made sources of N2O

2. L9 – where have the variations in N2O flux been noted? List some refs

3. L9-13 – make this one long sentence into 2

4. P5336, L8 – 'microbial activity' instead of 'activity of microbes'

R: The introduction was revised. The new introduction focused on the necessity of a study on the reservoir, especially on the littoral zone. Limitation of the previous work by others in the littoral zone were discussed as well as the contribution of this work. Considering focus and length, some rather general matters were deleted.

Methods/Results/Discussion

1. P5337, L23-25 – there should be more explanation as to how this unusual flooding impacted your sampling design or results. If this is not an every year occurrence then this will have implications for your results.

R: This provided us with a seasonal flooded area which made possible an exploration of the effects of summer flooding on greenhouse gas emissions. The water level increase in summer does not happen every year, in some years the level is stable; it may even decreased. The sentence was rewritten to clarify.

2. Figure 1 – The figure is nice but I'm confused about how many plots within a site there were. This needs to be made explicit in the figure caption and text. I believe there are the 5 major sites relative to water level, then at each site you had 3 sampling locations and at each of those you made 4 replicates – these last two numbers would explain the many ovals in the figure, correct? And then you performed this sampling 7 times each day you sampled (so over almost a 24 hr period) and you did this 6 times in the year to cover different seasons and covering the transition in and out of the flooding season well. Is this correct? Please present a more organized way to say all of this in the methods section and again in the figure caption.

R: Yes, exactly. Both figure caption and methods were improved carefully.

3. P5341, L2 – you say that significant differences were found between the 5 sample areas, but it looks like from Figure 4 that only NF is different from the other sites and that the other sites are all similar. Is this true? This also lends to my concern that NF does not belong in the analyses. And now that I look closer, I see that C in every panel (at every site) is different than the rest. What makes C so special? I see that A, B, and C represent different vegetation but you don't describe this anywhere in the text. Please sort this out and explain the vegetation types and why C would be so different.

R: Yes. The only different flux was in NF. C in SFC and NF grew maize in the year of study while C in SF and SW was maize during last summer. Details of plant species at each plot are now listed in a table in revised manuscript. Flux of 'natural' and 'farmland' are shown seperately and discussed.

4. Table 1 – define 'SWC' in a footnote or somewhere.

R: Done. Added in footnote.

5. P5342, L6 – is this Austrian lake study the only other temperate lake that had emissions measured in the littoral zone? Make that clear if it's the case.

R: No, the report on littoral zone in temperate zone is limited, but this is not the only one. We changed the sentence in manuscript, pointing out that the Austrian lake was an example.

6. P5342, L9-12 – this is not a fair comparison -> while both of these systems are located in temperate regions like yours, the Diem paper looks at only high elevation lakes and presumably the Jacinthe study was done on a low elevation reservoir. I think this paragraph needs a bit more reworking to make sense logically. Also, you state later on line 20-21 that your emissions are much lower than those from boreal and Antarctic lakes. Then mention something important about water quality that comes up again later (P5347,L5-6). The comparisons with other lakes and reservoirs have to be done in a logical way considering major factors, such as latitude and climate zone but also elevation and general characteristics. There is potential here for a nice literature comparison but it needs work.

R: The text has been re-organised, and we hope that it is now more logical. Of course, there are many variables when one compares sites to put together the global picture, and the data available are still quite sparse. Therefore, it is hard to generalise.

7. L12 – where is this Jacinthe reservoir located? Put it in the text.

R: Information was added. It's near Indianapolis, USA.

8. L13 – why do all the 'ffi' look funny throughout the paper?

R: Evidently, this font makes 'ffi' look funny. We submitted in Times New Roman where 'ffi' looked normal.

9. L22 – 'might be because'

R: Done.

10. P5343, L7 – You should definitely give some more details about why your earlier report was more biased because of the flooding.

R: In our previous study, N_2O variation was investigated with a water recession process. Significant increases (nearly up to 1000 times) of N_2O flux were observed after sediment exposure of 5 months which were believed to be mainly caused by soil water content declining to 60-90%. In this research, the soil water content never was in this range and that may have biased the comparison. This information is now added in manuscript.

11. P5344, L6 – it 'could' or it 'should' inhibit? Is this is a proper debate? Or there is just no consensus?

R: Gas transport by diffusion in unstirred water is about 10.000 times slower than transport in air. We were merely indicating that standing water will tend to cause anoxia. We think that isn't controversial, so we don't see a reason to change the statement.

12. L8 – I believe what you meant to say here was 'While our results did not reject this possibility, they did not completely support that hypothesis either.'

R: Yes, revised.

13. L11 – this 'extraordinary' observation at SF-C is interesting and I noted it earlier as well. This C vegetation needs to be explained.

R: C in SF and SW used to be maize, at least during the last summer, while C in SFC and NF had maize during sampling. Details of plant species at each plot are listed in table of the revised manuscript. To explain the uniqueness of C,the flux of natural and farmland are shown seperately and discussed.

14. P5345, L4 – ‘emission even more challenging’

R: Done.

15. L5-7 – the English here needs to be improved

R: This sentence was replaced by more clear statement of implication.

16. L8 – the subtitle is ‘other soil conditions’ – are you using the word ‘soil’ here to also represent ‘sediment’? For the most part, the bottom of a lake would be considered sediment and not soil. This is perhaps not the case when you are in the littoral zone and have seasonally flooded soils. However, you site DW seems to have very different ‘soil’ than the other sites based on Figure 3. Was DW also used in the correlations? Again, this may be a situation where you are comparing apples and oranges. I would take a look at the correlations with and without DW.

R: The ‘soil‘ in text was changed into ‘soil/sediment‘ when refered to both flooded and non-flooded soils.

Yes, DW was used in the correlations. Below the correlation was shown seperately of each water level. A bigger correlation table is now added. Discussion on the reasons for both low coefficients and differences is also added in text.

Spearman’s Rank Correlation (r) between flux and environmental variables.

		Wind speed	Air temp	Water depth	SWC	Water DO	Biomass	Bulk density	Soil pH	Soil TC	Soil TN	Soil NH_4^+	Soil NO_3^-
Farmland and non-farmland	All site	0.14*	0.19**	-0.02	-0.12*	0.35**	-0.08	0	0.08	-0.04	0.03	0.01	0.25**
	DW	0.45**	0.41**	0.40**	0	0.32**	-0.35**	-0.02	0.25*	-0.34**	-0.34**	0.01	0.24*
	SW	0	0.38**	0.19	0	0.11	-0.12	0.09	-0.06	0.12	0.12	0.08	-0.13
	SF	-0.13	-0.06	-0.1	-0.23	0.23	-0.11	-0.03	0.03	-0.04	0.16	0.23	0.11
	SFC	-0.01	0.15	0.2	0.28	No data	-0.27	-0.09	0.08	0.15	0.08	-0.23	-0.03
	NF	0.21	0.18	0.35**	0.32*	No data	0.04	-0.41**	0.29*	0.27*	0.33**	0.2	0.48**
Farmland	All farmlands	-0.01	0.38**	-0.11	-0.04	0.14	0.11	0.13	0.19	-0.08	-0.06	0.03	0.25*
	SW-C	-0.19	0.57**	0.39	0	0.09	0.12	0.18	-0.04	-0.18	-0.18	-0.04	-0.08
	SF-C	-0.37	-0.12	0.03	-0.17	-0.43	0.38	-0.03	0.03	0.08	0.08	-0.09	0.09
	SFC-C	0.12	0.77**	0.72**	0.75**	No data	-0.73**	0.24	-0.24	-0.11	-0.11	0.11	-0.24
	NF-C	0.12	0.61**	0.09	0.54*	No data	0.09	0.03	0.02	0.05	0.11	-0.22	-0.22
Non-farmland	All non-farmlands	0.18**	0.14*	0.1	-0.11	0.42**	-0.14*	-0.09	0.02	0.11	0.13*	-0.14*	0.21**
	SW-A, B	0.08	0.38**	0.13	0	0.09	-0.13	0	-0.07	0.25	0.2	0.14	-0.03
	SF-A, B	-0.09	0.06	-0.24	-0.38*	-0.15	-0.18	-0.02	0.07	0.07	0.07	0.31*	0.11
	SFC-A, B	-0.11	-0.12	-0.05	0.15	No data	0	-0.33	0.03	0.24	0.07	-0.75**	0.05
	NF-A, B	0.22	-0.14	0.29*	-0.01	No data	0.1	-0.11	0.30*	-0.2	-0.2	-0.11	0.34*

N is from 12 to 324.

17. L13 – what were the other five soil variables that correlated with CH4 flux and not N2O flux? This entire paragraph should be comparing these relationships but it is not clear to me what the correlations with CH4 flux were and thus I cannot tell how they were different from those with N2O. You seem to be just listing possibilities for soil-N2O correlations from

previous findings. Either make more reference to CH4 in this paragraph or not at all. This point of this paragraph needs to be better focused.

R: The other five soil variables were soil bulk density, pH, TC, TN and NH4+. This paragraph is reorgnised and more references are cited for CH4.

18. P5346, L7 – there are more relevant papers than the Schilder one to describe gas exchange processes in water. Use a more commonly cited paper.

R: Discussion on wind effects was deleted, considering such weak indications of correlations in our data.

19. L10 – why do you assume that wind influences gas exchange over soil more than over water? I wouldn't necessarily assume that and you shouldn't in this case. If this is known, then present a reference. This needs further discussion. And in general, this paragraph needs to focus more on how YOUR wind data impacted fluxes at each of your sites. You have saturated and unsaturated sites. Use that to draw more conclusions.

R: The correlation between flux and wind speed was analysed in each water level. Considering the low correlation coefficients and the pattern of the scatter plot, disscussion of the wind effects has been abandoned.

20. L21-23 – Improve these sentences: 'For N2O, negative relationships between N2O flux and oxygen are reported in both laboratory experiments and field studies (xxx). This is explained by the fact that denitrification, which is activated in anoxic environments, is likely controlling N2O emissions ().'

R: Thank you! Done.

21. Line 24-25 – ': : :those previous conclusions because a significantly positive correlation: : :'

R: Thank you! Done.

22. Line 25-26 – 'This implies that in some environments different processes may control N2O emission rates.'

R: This sentence was deleted. More references were cited to make the discussion on the effects of water DO clearer.

23. P5347, L1 – 'in the water column has been shown to depend not only: : :'

R: Thank you! Done.

24. L3 – 'might provide an explanation for our finding.': : : please explain this more. How does this explain??

R: One new reference was cited to help explain our positive correlation. This study showed that denitrifying activity decreased with a decline of DO concentration, but the N_2O producing activity increased because of less N_2O reduction to N_2 (Senga et al., 2002). Furthermore, this study also pointed out that N_2O produced by nitrification could also be reduced to N_2 via denitrification. That might have happend in our study, i.e. along with increasing of water DO, a decrease in N_2O reduction to N_2 allowed more N_2O to be released at the water-air interface, no matter which processes produced the N_2O.

25. L5-8 – are you saying that your reservoir is clean and that is why you didn't find a negative relationship with DO? Please explain more clearly your point with this last statement.

R: We were trying to relate to practical activity. Beacause of the lack of consistency, this statement is now replaced by something more specific.

26. Line 24 – 'Reservoir construction does provide an: : :'

R: Thank you! Done.