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Interactive comment on "Regulation of N_2O emissions from acid organic soil drained for agriculture: Effects of land use and season" *by* Arezoo Taghizadeh-Toosi et al.

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I have copy the response letter below. However, the comment and responses to both reviewers' comments was uploaded in the form of a supplement, in pdf file.

Interactive comment on "Regulation of N2O emissions from acid organic soil drained for agriculture: Effects of land use and season" by Arezoo Taghizadeh-Toosi et al. Anonymous Referee #1 Received and published: 28 February 2019

This manuscript investigated N2O emissions and concentrations in peat soils under 2 agricultural crops: grassland and potato) at 2 distinct site locations during spring and

autumn season of one year only. All combination (site x crop) treatment received different management in terms of fertilisation and harvesting etc. The N2O production measurements were characterized with static chambers and soil N2O diffusion probes placed at 5, 10, 20, 50 and 100 cm depths. All potential environmental factors (climatic or edaphic) were also monitored during this period. This manuscript has been resubmitted and is substantially improved and conclusions are now validated. It would appear that a lot of fieldwork and indeed field data have been processed and are not equally discussed here but is focused on the title of the manuscript. It is well written and sufficient information provided to allow their reproduction. Some minor comments below would help clarify some details of the experiment and the results. Response 1: Thank you for this positive feedback and helpful review. We have carefully considered all comments, and below we respond in more detail.

Line 11: rephrase or change word 'extensively' or 'intensive'; there is nothing extensive about growing cereals or potatoes on organic soils given the cultivation/fertilisation inputs. Perhaps it was meant to be 'widely' used? Response 2: We will change the word 'extensively' to 'widely' to avoid ambiguity.

Line 24: emissions could be given per unit of time, either day or season. Where are those days in terms of season? Response 3: The sentence will be modified for clarity. We propose the following wording: "Spring and autumn monitoring periods together accounted for 152-174 days, and during this time the cumulative N2O emissions were 3-6 kg N2O-N ha-1 for rotational grass, and 19-21 kg N2O-N ha-1 for potato sites."

Line 79-83 belongs to methods; go straight to your hypothesis questioning the role of crop type and seasonal variation Response 4: Thank you for this suggestion. We would like to keep the first sentence to establish the context, but agree to remove the detailed information about measurements (Line 81-83).

Line 130; the fertilisation treatment is different in each site and therefore do not act as replicate but different treatment. Response 5: It is true that, in order to follow the actual

management at each site, different fertiliser types and rates were used. However, the fertiliser treatment was only represented in the statistical analysis as a categorical variable, i.e., for testing if N fertilisation of, grassland and the potato crop influenced the emission of N2O.

L149 each field trip being a day sampling so 2 sites were sampled per day maximum but all were sampled during the same week? Rephrase please. Response 6: We propose to rephrase the text as follows: “Field trips included sampling at two sites, either AR1 + RG1 or AR2 + RG2, and thus all four sites were visited during two field trips on consecutive days.”

L258 it is not clear that cumulative N2O emissions are here total or on a daily average. Response 7: We propose the following rewording to clarify: “The model for daily N2O emission described above was used to estimate cumulative emissions by integrating the flux curves over time. Treatment effects were then analysed by specially designed linear contrasts as described in detail by Duan et al. (2017), who showed that models with untransformed responses (when using adequate distributions) allow simple statistical inference of the time-integrated N2O emissions.”

Line 301 : average deviation of soil temp from air temp is given; could it be better described in terms of sign L304. Response 8: It is not quite clear if some text is missing here. We report average deviations, as well as the largest positive and negative deviations observed.

It stats in Lin 166 that soil samples were taken at the start of each season April and Sept? Response 9: The soil characteristics reported in Table 1 were based on analyses of soil cores sampled in April except for AVS and CRS, which were analysed with soil cores sampled in September (as stated in the Table caption). This will be specified in the text also.

Depth of total peat layer should be shown in Table 1 as it seems that RG2 is very shallow peat ((<25cm). Also von post figure should be given for each peat layer.

Response 10: Unfortunately peat depth was not determined (but general information given in L. 95), and as stated the degradation at site RG2 was extensive. We will refer to von Post values determined at a grassland site located on the same East-West axis as the four monitoring sites of this study (Schäfer et al., 2012. Seasonal methane dynamics in three temperate grasslands. Plant and Soil 357: 339-353).

Line 350. The WT reported in Figures 5 & 6 is confusing; what are they if you are not showing your continuous measurements (which shows higher WTL?) Response 11: The WT reported in Figures 5 and 6 were the weekly values measured concurrently with flux measurements. By referring to the continuous measurements, we wanted to stress that soil conditions were highly dynamic, and that the nitrate reduction potential could have been influenced by this. For consistency across seasons, we would prefer to show the values obtained at the time of flux measurements in all contour plots.

Line 407: there in previously in this paragraph, it would help to add the DOY (as per line 410) or else include the month in your Figures. Response 12: We will add this information, so that the last sentence reads: “The highest emissions occurred, independent of fertilisation, in June when a WT rise to 35 cm depth was observed on DOY154.”

Line 415: this is the first time that the monitoring period is mention; this should be explicitly shown in Table 2 at least and therefore rather than total a per day average would be better to compare treatment. Response 13: Please note that the overall monitoring periods in spring and autumn were defined in Line 143. We will include the specific DOY for each site in Table 2.

Figure 3-6: the WT is visible in blue not in grey. Response 14: We acknowledge that black and white reproduction will make it difficult to see WT lines in AR plots with dark grey areas. We will consider an alternative colour combination.

Figure 7 : the statistical number on the graphics should be explained in the legend since it is not clear to which lines they apply (especially 7a). Response 15: Thank you for the comment. We will revise the legend and consider a way to clarify further the

link between lines and statistical information.

Please also note the supplement to this comment:
https://www.biogeosciences-discuss.net/bg-2019-14/bg-2019-14-AC1-supplement.pdf

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