SC#1 comments and author responses to ms bg-2020-230

Reviewer comments are given in italic and with author responses in normal style

Interactive comment on "Sub-soil irrigation does not lower greenhouse gas emission from drained peat meadows" by Stefan Theodorus Johannes Weideveld et al.

Having been involved in the latest discussions on the research presented in this paper, I would like to post 2 comments:

> **Response(1)** We thank the Jos Schouwenaars for the positive comments and constructive inputs. This will help us improve the manuscript.

1. In 2019, on some of these study sites, additional emission measurements have been made, using eddy covariance techniques. These measurements indicate far lower emissions as the ones with closed chambers, used in this study. It was recognized by the researchers that this might be due to an erroneous gap filling procedure. This should be mentioned and explained in this paper.

> **Response(2)** The uncertainty of the interpolation will be updated, to give a better estimate of the restriction of the used method and gap filled procedures. However one of the eight sites was measured using Eddy covariance technique in a different year than presented in this manuscript.

2. The results do not indicate a difference in emissions rates between the sites with subsurface infiltration and the control sites. It should be mentioned that this conclusions is valid for the design of the infiltration and the soil type as used in these experiments, i.e. - drains at a depth of 60 cm and at a distance of 6 meter. - sphagnum peat type with a very low permeability. These additional remarks are required because, despite the obvious results for these study sites, it might be possible that subsurface drainage leads to lower emission rates when applied with alternative designs (e.g. lower depth, smaller distances, in soils with higher permeability, with addional water reservoirs to increase water pressure etc.). Consequently it also is important to adapt the title of the paper.

> **Response(3)** A change will be made in the title and conclusion, to clarify that the current design of SSI is the commonly applied compromise between additional drainage and increased infiltration during summer and that this technique may fall short to have a significant effect on the GHG balance. The design being at a depth of -70 and spaced 6 or 5 meters apart. Furthermore, information will be added in regard to the average ditch water level to indicate that the goal of a water table of -60 was further promoted by raising the ditchwater in de summer periods, on average the ditch water level connected to the SSI was closer to -40 than -60.
> We agree that the functioning of the SSI is closely related to the type of peat present. Farm A, C and D all have Sphagnum peat, with the layer where the pipe is present being moderately decomposed (H5-H7). We suspect there are some macro cracks in the peat soil of farm A, that help infiltration. For location B the peat soil consists of Alder peat. The layer where the pipe is present is moderately decomposed but with a large presence of wood/branches. For this location the SSI seems to work best. With a strong drainage and infiltration effect.
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> Further research is needed to see if other SSI designs can be adjusted to have a significant effect on the emissions.