Reply to RC1

Reviewer comment: *My main criticism is the lack of stable isotope data on the CH_4 from the meltwater samples, which makes the interpretation of the CH_4 source(s) and so the governing mechanism(s) (see line 59) of the emissions difficult.*
Reply: We have added stable isotope data from melt river samples taken at the upstream station in summer of 2023 in Figure 3 and wetness ($C_1/(C_2+C_3)$) to the supplementary. We have also added stable isotope data from melt river transects taken in 2023 in Figure 5. We have updated our abstract, methods, results, discussion and conclusion with the new data accordingly.

Reviewer comment: *The claim that "small valley glaciers like Vallåkrabreen can be a substantial source of methane, challenging previous theories that subglacial methane is largely produced microbially in the anoxic environment beneath large ice sheets" (l. 440-441) makes little sense, since if the CH_4 is thermogenic (which seems likely given its high concentration and the expected low bioavailable OC content in the subglacial environment) the glacier itself (or rather its ecosystem) is not the source but rather its meltwater acts as a mobiliser/carrier, and the comparison of Vallåkrabreen and Leverett Glacier and their catchment sizes (l. 291-294) is beside the point.*
Reply: We have changed the text in line 440 to read: "…the meltwater of small valley glaciers like Vallåkrabreen can mobilize a substantial amount of methane…". We also believe that the comparison to Leverett and the differing catchment sizes is important, as it demonstrates the key point that small glacier catchments on Svalbard may represent notable methane sources – potentially releasing a larger amount of methane per area than large ice sheets. Existing literature has largely focused on outlet glaciers to the GrIS with the idea that subglacial methanogenesis is the main source of methane in glacierized environments. Our findings provide an alternative source that bring thousands of smaller valley glaciers into the spotlight as potential methane emission hotspots. We have made these points more explicit in the text.

Reviewer comment: *The true focus and novelty of the study should also be made clearer in the (last paragraph of the) introduction – at the moment it's quite drowned.*
Reply: We have updated the last paragraph of the introduction as suggested.

Reviewer comment: *l. 33 Subglacial C stores have also been estimated to be significant (Wadham et al 2019 Nat Comms) and should be mentioned.*
Reply: We have added this important reference.

Reviewer comment: *l. 41-42 Vinsova et al. (2022 Glob Biogeochem Cycles) provide an overview of Arctic subglacial OC and its potential microbial degradation and could be mentioned.*
Reply: We have added these references.

Reviewer comment: *l. 102 What was "sufficiently high CH_4 concentration" in this case?*
Reply: We have removed this statement, as we have added the carbon isotopic signatures of the methane in the river from 2023.

Reviewer comment: *Fig 2 Is there any correlation between Q and CH_4?*
Reply: No. We have checked for a correlation between CH4 and the Q at the time of sampling, as well as the peak Q of the day and neither yield any correlation so we did not think it was important to include.

Reviewer comment: *I also recommend the authors fix the inconsistencies in tense (past vs. present) and voice (passive vs. active) throughout the text for a better reading experience.*
Reply: Thank you for pointing this out – we have fixed the inconsistencies of the tense throughout the text.