In the text below, our responses to the Reviewer' comments are shown in blue, whereas our resolve and modifications in the manuscript are shown in purple.

Interactive comment on "Quantity and distribution of methane entrapped in sediments of calcareous, Alpine glacier forefields" by Biqing Zhu et al.

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This is an interesting, thorough characterization of the distribution of methane trapped within CaCO3 in glacial fore field deposits. The methane is released when the CaCO3 is dissolved in acid, a somewhat aggressive analog for chemical weathering. The authors are very careful not to overstate the implications of their data to the global methane cycle or climate, even though as they point out, the actual quantity of methane is rather high relative to other regional metrics. The primary motivation for investigating this is curiosity, which is a perfectly fine motivation for publication. I would be curious whether the methane has a measurable impact on the microbiology within the sediments; whether there is metabolic energy to be gained by reacting the methane with anything available, and whether RNA or proteomics of some other type of biotech characterization could detect this activity. Probably any methane-driven metabolic activity would be at low level, given the apparently conservative behavior of the methane that the paper documents. This is not a suggestion for idea for the current paper, obviously, which I would recommend for publication as is, with only one editorial suggestion, from line 73, "virtually omnipresent" could be changed to "found virtually everywhere" or something like that. The former phrase makes the methane itself seem virtual.

We would like to thank the Reviewer for the overall positive assessment of our manuscript.

We agree with the Reviewer that it would be highly interesting to investigate whether this entrapped CH_4 has an impact on the microbiology within the sediments, particularly on methane-oxidizing bacteria (MOB). In earlier studies (e.g., Chiri et al. 2017) we have confirmed the presence and activity of aerobic MOB utilizing atmospheric CH_4 in calcareous glacier-forefield sediments. This group of MOB is well adapted to utilizing CH_4 at low levels (< 2 $\mu L\ L^{-1}$ in gas phase) in this environment. Indeed, a set of recently conducted experiments in our laboratory yielded first indications that these MOB may utilize (i.e., oxidize) trace amounts of previously sediment-entrapped CH_4, which "leaks" from the calcareous sediments into the sediment-gas phase. However, we consider these experiments to be preliminary, additional experiments will have to be conducted for confirmation. But as indicated by the Reviewer, this topic is beyond the scope of the current manuscript.

We also agree with the Reviewer's editorial comment, and have re-phrased the sentence in question to now read:

"…we established that entrapped CH_4 was present in nearly all sediment and bedrock samples collected throughout this catchment…"