

Response to referee comments of manuscript “Porewater $\delta^{13}\text{C}_{\text{DOC}}$ Indicates Variable Extent Of Degradation In Different Talik Layers Of Coastal Alaskan Thermokarst Lakes” by Ove H. Meisel et al.

We thank referee #2 for the comments and the constructive discussion of this manuscript. In the following we reply to your remarks. *(Any line number references (L...) are based on the originally uploaded manuscript. Our responses to the comments are written in green color and italic letters. Newly written text that will be added to the revised manuscript is underlined.)*

Referee Comment #2 (Received and published: 12 January 2021)

Meisel et al. characterized OC concentrations and degradation beneath two thermokarst lakes in Northern Alaska. They find DOC characteristics originate within individual sediment facies, with little evidence of potential exchange between facies. Using stable isotopes, the authors identify DOC in the lake sediments as showing more evidence of processing compared to the underlying, deeper talik sediments. The findings provide a nice dataset of OC characterization and DOC processing beneath two thermokarst lakes, and their classification of sediments into two primary units (lake sediment and taberites) both fit in with and expand upon previously published research. The paper is well written, and I recommend publication with only a few minor edits.

Dear referee #2, we thank you for your positive assessment and kind words.

Minor comments:

The term “layers” should be replaced by “facies,” which is the technical term for sediment/geological layers with the same attributes and has been previously used in the context of thermokarst lake sediments (e.g. Farquharson et al., 2016, doi: 10.1016/j.sedgeo.2016.01.002).

We agree that the term “facies” is more suitable when the text refers specifically to sedimentary/geological units. The word “layer” will be replaced (40 times) by the technical term “facies” in most of the manuscript (L97a, L97b, L100, L101, L103, L250, L251a, L251b, L253, L257, L314, L333, L344, L357, L385, L429, L472, L473, L474, L481, L484, L485, L488, L490, L491a, L491b, L498, L518, L528, L537, L541, L559, L563, L564, L567, L569, L577, L581, L582, L587). In several instances we will leave the term “layer” which allows for a better flow of reading especially when the text explicitly refers to talik units in general and not specifically to sedimentary/geological units (L95a, L95b, L129, L149, L262, L437). This also includes the title (L2) and the whole abstract (L21, L 23, L27, L40) of the manuscript. We believe that it will be easier for a broader range of readers from different scientific fields to follow the manuscript when the wording of the title and abstract are kept in more general terminologies. The term “facies” will be introduced in L96 where it will be used together with the term “layer”, additionally, the suggested reference (Farquharson et al., 2016) will be added in L96 and in the list of references (L681). In the conclusions in L573 the terms “layer” and “facies” will be also be used together for a better understanding for readers who quickly screen through the abstract and the conclusions first before reading the complete manuscript.

In thermokarst lake sediment literature, the “deeper talik” facies of former permafrost thawed in situ is referred to as “taberite” (e.g. Grosse et al., 2007, doi: 10.1016/j.geomorph.2006.08.005; Heslop et al., 2015, doi: 10.5194/bg-12-4317-2015; Walter Anthony et al., 2014, doi: 10.1038/nature13560).

We will replace the descriptive term ‘deeper talik’ in the whole manuscript (71 times) and in Fig. 5, 6 and 7 (3 times) with the scientific term ‘taberite’, strictly based on the definition of the word in the suggested references (Grosse et al., 2007; Heslop et al., 2015; Walter Anthony et al., 2014). The term ‘taberite’ will be further explained in L79 of the manuscript with referral to the above mentioned publications:

“In particular, it is unclear to what degree the uppermost talik layer of the ‘lake sediment’ and the thawed permafrost soil layer, known as taberite (Grosse et al., 2007; Walter Anthony et al., 2014). are affected by degradation processes (Heslop et al., 2015).“

(The publication by Grosse et al., 2007 will also be added to the list of references in L681.)

Line 17: Remove “up”

Agreed, the word ‘up’ in L17 will be removed in the revised manuscript.

Line 62: (Anthony et al., 2014) should be (Walter Anthony et al., 2014)

Thank you for pointing this out. The reference will be adapted accordingly in the manuscript in L62 and L66 and in the list of references (L620).

Figures 2 and 3: The yellow numbers and label, and the light blue “Silicon” label, are hard to read on the white background. Colors with higher contrast would be better. Figure 4: Same comment as Figures 2 and 3; the yellow is difficult to read on the white background.

Agreed, the yellow/orange and light blue colors are hard to distinguish from the background in all three figures. We will change the axis labeling, tick mark labeling and the plot line color in Fig. 2, 3 and 4 to higher contrast colors for better visualization.