

Authors response to Jeremy May comments:

The authors will like to thank Jeremy May for his positive review and helpful comments to the manuscript. We greatly appreciate your time for providing insight.

We responded and clarified in detail to each of your comments/suggestions below ([highlighted in blue](#))

Jeremy May commented:

*This study investigates the impact of nutrient availability of emergent tundra plants, specifically the two dominant species *Carex aquatilis* and *Arctophila fulva*, in communities on the coastal plain of Alaska. This study is timely and important to the field of climate change because it investigates the role of nutrient availability on these wet tundra communities and how shifts in nutrient levels can alter ecosystem productivity.*

I would like to thank the authors for the submission of this manuscript for publication and the high quality of both the study and the manuscript. The manuscript is very well written and conclusions are sound. The study is well designed and justified. I would like to make suggestions and get clarification on just a few specific points below.

Lines 105-107: The sentence “The ACP is dominated. . .” needs citation

[We added Hinkel et al 2003](#)

Lines 165-166, 172, 187, 200: For several sampling methodologies you refer to previous studies but it would be good to provide at least a sentence or two briefly describe the methods so that the reader has more of an specific idea without looking up each reference.

[We modify the text to provide clarity to the reader on the methods:](#)

[L165-166 as requested, we added the details on standard water chemistry methods: “water chemistry of followed standard methods \(American Public Health Association 1998\) where nitrate-nitrogen was quantified by cadmium reduction; ammonia using phenate method; total phosphorus by ascorbic acid method with persulfate digestion; soluble reactive phosphorus by the ascorbic acid method; and, silica using the heteropoly blue method”.](#)

[L172- we changed “...following the methods of Andresen *et al* \(2018\).” To the following paragraph to read “Following Andresen *et al* 2018,...” for clarity given that that paragraph describes in detail Andresen *et al* 2018 methods already. See also next comment on lines 170-177 for full paragraph.](#)

[L187 & L200- We did not consider that these methods were critical for the manuscript and are also lengthy. No changes made.](#)

Lines 170-177: It would be worth noting whether there was standing water present in plots scanned with the Jaz spectrometer. If water was present did the authors make any corrections for the presence of surface water that may have altered the plot reflectance values before calculating NDVI?

[To clarify this, we added to lines 170-177 :](#)

[“Following Andresen *et al* \(2018\), reflectance measurements were collected during sunny](#)

conditions between 12 and 4 pm for maximum solar elevation angles (29° - 33° , ~2pm is highest <https://www.esrl.noaa.gov/>) and to best match satellite observations. The person doing the collection was standing in the opposite direction of the solar azimuth angle to avoid any effects of shading by the instrument or person. All plots for both aquatic species were inundated at time of sampling (including soil, plant and spectral samples) with a water depth (\pm SD) of 25.2 ± 4.6 for *A. fulva* and 10.3 ± 3.22 cm for *C. aquatilis*. Solar specular reflection of water on aquatic emergent plant spectral measurements was insignificant given that solar elevation angles are relatively low in the Arctic ($\sim 33^{\circ}$, peak season) and solar specular reflection was outside of the ~ 1 m spectral footprint of the measured plot.”

Line 187: Were the phenocams facing straight down on the plots, similar to the measurement field of the Jaz? Or were they pointed out across the landscape? These are the details that would be helpful for a reader

We mention in line 185 that cameras are collecting oblique images which is a different angle to the nadir-view NDVI spectral measurements. To clarify to the reader we added in line 194: “Oblique-angle GEI collected from cameras in this study is strongly associated to nadir-angle NDVI for both *A. fulva* and *C. aquatilis* (Andresen *et al* 2018).”

Lines 205-206: Did the authors collect any data on the density of vegetation within each biomass and reflectance sampled plot? Some of the NDVI values seem very high and some representation of canopy and ground cover data might help explain this.

NDVI values were very high in nutrient-enriched sites due to high density of plants and their large, elongated vibrant green leaves that covered the plot. We have tiller density data for reference sites only but not for enriched. Anecdotal estimates for enriched sites are up to 10 times the density of reference sites.

Figure 5: The legends and plots within the PCAs would be more intuitive if the shapes for each plot were consistent for each site type.

We made the change as suggested

Lines 325-326: It is unclear here what studies cited show a Ca increase between 1970 and 2013. It appears that the authors are citing Chapin 1980 for this point.

We added the citation “Chapin *et al* (1975)” to the text for clarity

Thank you,

C.A & V. L.