

## ***Interactive comment on “The catastrophic thermokarst lake drainage events of 2018 in northwestern Alaska: Fast-forward into the future” by Ingmar Nitze et al.***

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I 348. I understand that the June 2019 temperatures at Kotzebue were erroneously high, so this mean annual average of 0.12 deg C might be exaggerated slightly. But the overall story of temperatures rising to near freezing should not be affected.

We acquired the latest NOAA data on 29 July 2020. In this new updated dataset temperature data from 1 May through 3 September 2019 indeed were removed from NOAA due to erroneous measurements. For winter year 2019 we calculated the temperature difference during the period with available data, 1 July through 30 April, and interpolated until 30 June 2019. We stated in the text and captions that these values are

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interpolated. We updated sections 3.3.1 and 4.2.1. We furthermore updated Figure 5, Table 4, and Supplementary Table 3 and marked 2019 with an asterisk (\*). Precipitation and snowfall data remained unaffected by the weather station issues during 1 May - 3 September 2019. Reviewer 1 is correct that the overall story of temperatures rising to near freezing is still valid.

I 350-351. Its not clear which year these numbers refer to.

It now reads “During winter year 2018 the weather station Kotzebue recorded only ...”

I 352. Table 4 not 5.

Changed to “Table 4”

I 362-363. The use of "increase to" and "increase of" is grammatically correct but a little confusing here. Also, the increase of 3.7 to 6.6 C is relative to some older average, you should say what the older time period was.

We changed the sentence to “... which marks an increase of 3.7 to 6.6 °C compared to the period from 2010-2019 ...”

I 403. Another reference to degraded surface morphology. Does this mean pervasive thermokarst?

We changed the structure of the sentence and added: “The highly degraded surface morphology in this region indicates active and pervasive thermokarst processes.”

I 421-422. There's no evidence of beavers in the Espenberg region that I know of. I don't think they had any role in any of the big northern Seward Peninsula lake drainages that you describe. In the Kobuk valley I've seen where they dam up the outlet of a drained lake, allowing it to refill.

Over the past two decades the beaver population has expanded significantly across NW Alaska, which is shown in Tape et al., 2018 and Jones et al. 2020. The latter found strong beaver activity on the Baldwin Peninsula, which is part of the study area.

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Although currently, beaver activity is unlikely at the (coastal) Cape Espenberg region, beaver dams were detected on the southern part of the northern Seward Peninsula with recent very-high-resolution satellite imagery. We changed the wording of the sentence to focus more on lake dynamics, as beavers are at the moment more responsible for lake growth: "The recent movement of beavers from the treeline to tundra regions in northwestern Alaska could also be a contributing driver of lake dynamics in the eastern and southern portions of the study region that requires further attention (Tape et al., 2018; Jones et al, 2020b)."

I 431. "drainage, in addition to the weather-induced driver."

We split the sentence into two separate sentences for easier readability.

I 464. "so-far"

We removed "so far"

I 475-477. I expect that the North Slope will see a similar outbreak of lake drainages when its temperatures hit 0 C also. Do you have any predictions about if and when that will occur?

The SNAP model ensemble for scenario RCP8.5 predicts MAAT of  $-2.6 \pm 0.3$  °C and MAP of 315 mm for the southern (lake-rich) part of the Arctic Coastal Plain. However, extreme events with high temperatures and precipitation may be likely much earlier, as seen in W/NW Alaska during 2017-2019. We added the following sentence: "Temperatures are predicted to approach 0°C (MAAT 2090-2099:  $-2.6$ °C) on the southern Arctic Coastal Plain in a RCP8.5 climate scenario."

I 483-484. "This in combination with excess surface water likely caused the rapid drainage ...". This sentence is also a bit long/run-on.

We split this sentence for better readability.

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