

## ***Interactive comment on* “Contribution of Coastal Retrogressive Thaw Slumps to the Nearshore Organic Carbon budget along the Yukon Coast” by Justine L. Ramage et al.**

### **Anonymous Referee #2**

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The submitted paper ‘Contribution of Coastal Retrogressive Thaw Slumps to the Nearshore Organic Carbon Budget along the Yukon Coast’ by Ramage et al. gives an indication of the specific impacts of slumps on the sediment budget and on the carbon budgets of Arctic tundra coasts in northern Canada. The focus is on three main topics as stated at the end of the introduction: 1) definition, quantification and temporal analysis of RTSs; 2) estimation of sediment/ice and OC budgets related to these slumps; and 3) measure the OC fluxes between 1972 and 2011. Looking to these aims of the study, I have some specific comments related to these different goals and will come with suggestions to restructure some parts of the paper to make it more focused on the RTSs. The data presented is very valuable and the paper will after restructur-

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ing be a valuable contribution to better understand Arctic coastal environments and its changes.

Ad 1). The coastal stretch in NW Canada is probably very representative for a large part of the Arctic coastal environments. The different geomorphological units (or geological units as stated in Figure 1) cover a wide range of environments and the coastal stretch with its units can probably be used to upscale the findings. You can state explicitly that you use the findings along this stretch to upscale in the future. Use Figures 2 and 6 to define what RTSs are. Tables 1 and 2 give an indication of the amount and sizes of RTSs for different units. It would be good to start the explanation of the spatial pattern, followed by the development in time. Now, it starts with changes in time, without having an idea how many and how large the RTSs are in the different units. Another thing is the use of the terms active or stable RTS. What kind of conditions do you use to call a RTS active or stable? Is it related to fresh scarps, vegetation coverage?

Ad 2). Estimation of the sediment/ice erosion due to RTS and OC budgets is quite straightforward and the best you can do with the limited Lidar data. Figure 6 in your discussion is very nice and can be used to explain your estimation of budgets in an earlier phase. The presentation in Figures 4 and 5 is often a bit confusing. You followed a spatial axis on the x-axis, but you don't use this in the rest of the discussion. It would probably more interesting to group it according to the geomorphologic/geologic unit and discuss this variation in time. You also gave this unit-related results in tables 3,4 and 5. The volumes of eroded materials will be better visible if you don't use a cumulative sediment and ice volume on a logarithmic Y axis, but come with values for sediment and ice (different symbols).

Ad 3). I wonder why you made a separate aim only following OC budgets in time. I think it is more logical to describe the estimation of budget terms under 2) and thereafter discuss all terms (sediment / ice / OC) in more detail in time.

Other general comments:

Discussion and conclusions The discussion of the paper is now in 4 subsections (erroneous numbered 5.1, 5.2, 5.3 and 5.3). Following the three aims and the structure of the results, it is perhaps very attractive to start a discussion about the ‘static’ description of RTSs (sizes, amounts, coupling to geo units) and about the uncertainties in determining the RTSs using the data set. This can be followed by a second section about the changes in slump activity (your acceleration of slump activity). Then we have two sections related to the second aim: your sections about Eroded material from RTSs and Calculated OC fluxes. Finally, you can place it in a broader perspective as you tried to do in 5.4. This can also include some remarks about upscaling to Arctic shorelines. The conclusions are to the point.

Title The title is not covering the work done. You have showed many more results on the losses of ice and sediments and its changes in time as well. Impact not only OC budgets.

Small things: Page 2, line 9: Hugelius et al., 2014 is not in the reference list. Page 5, line 20: n=125 refers to? Page 6, Figure 3: Are all splines in the RTSs giving a sloping surface from N to S? Page 6, line 12: Can you estimate the coastal retreat impact (or assume ..%)? Page 11, Figure 4: Only Mr? Page 13, line 21: Wolfe and Dallimore or Wolfe et al. (see reference list) Page 16, line 13: Should be section 5.4.

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