Response to RC1 from Krogh and Pomeroy

We appreciate the thoughtful comments and insights provided by Reviewer#1, and below detail a response to each comment. **Responses are in bold**.

1- In the abstract change is shown in absolute units, I think they can also be presented as a % to get a faster idea of the magnitude of the change.

Response: We agree with the reviewer's suggestion and the units have been changed to % in the revised version of the manuscript.

2- When shrub expansion in the arctic is mentioned, I miss the reference to Sturm et al 2011. doi:10.1038/35079180.

Response: Yes, this is an important paper and it has been added to the revised version of the manuscript.

3- Were vegetation changes determined by aerial photographies? I have not found this information.

Response: Yes, vegetation changes were determined by Lantz et al (2013) using air photos.

4- I would like to see a very brief description of the method to disaggregate daily into hourly precipitation (even when references are provided).

Response: A brief description of the microcanonical cascade model used to disaggregate precipitation has been included in the revised version of the manuscript as per the reviewer's suggestion.

5- What is the advantage of using a "normal year" compared to use detrended series of historical climate?.

Response: The main advantage of using a "normal year" is that any trend or change point will be strictly associated with changes in vegetation, whereas in using a detrended weather series, changes in interannual variability may result in trends or change points not strictly associated with vegetation change.

6- It results a bit confusing the statement that there are not significant trends in seasonal precipitation, but all of them show break points. I think this is because the breakpoints in most of the cases occur at the beginning of the study period and it prevents affecting the trend analysis. Is this the reason? It could be mentioned in the discussion or when presenting the results.

Response: It is true that only spring precipitation shows a statistically significant and decreasing trend, whereas all the seasons show a decreasing change point. These two statistical techniques were used as they complement each other; however, a change in the mean does not necessarily produce a significant trend and vice versa. The reviewer's suggestion is reasonable as change points near the beginning or end of the time series will more likely result in no-trend, although this also depends on the selected significance threshold. This discussion has been added to the revised version of the manuscript.

7- Are the changes in DOY of peak discharge statistically significant? 1.5 days per decade do not seem a very big change.

Response: Yes, the trend is statistically significant. Throughout the manuscript only trends that are statistically significant at p-values <= 0.05 are presented. Although this trend might seem small (in fact it is -1.8 days/decade, figure 9c), over 60 years it results in peak flows occurring 10.8 days earlier.

8- A reduction in melt rates due to warmer temperatures was also presented by López-Moreno et al., 2012. DOI: 10.1002/hyp.9408

Response: Yes, an excellent paper. We have included this reference as per reviewer's suggestion.

9- A figure showing the mean annual hydrograph for control, changing climate, changing vegetation and changing climate and vegetation might result illustrative.

Response: We agree that such figure can be illustrative when looking at the mean hydrological conditions at Havikpak Creek and how they will change over time and so have included a figure showing the mean hydrograph under control, changing vegetation alone, changing climate alone, and changing vegetation and climate. This is referenced to Krogh et al's (2017) detailed analysis of the mean hydrological regime of Havikpak Creek.

10- When hydrological resilience is discussed in pag. 16, the use of change in P and Q in % (in addition to mm) would help. Probably the use of the term "mild resilience" is a bit unclear.

Response: Yes, change in % has been added to the revised version of the manuscript. We have modified and clarified the use of the term hydrological resilience in the paper.

11- I would include the changes in P as % in Tables 1 and 2.

Response: Change in % has been included for precipitation in Table 1 in the revised version of the manuscript. Table 2 does not include precipitation.

12- I would show al the trend values but just highlighting the statistically significant ones (as in Table 5)

Response: We do not want to suggest trends where they are not statistically significant. Our argument here is that a non-significant trend is not a trend. As such, we would like to keep it as it is, to avoid confusion between slopes with non-significant and significant trends during the analysis and discussion and have not changed this.

13-Title of Table 5, change bolt by bold.

Response: This has been changed as per reviewer's suggestion.

14- The Labels of the X-axis in Figure 8 overlap.

Response: This has been fixed as per reviewer's suggestion.