

**Response to Editor, Dr. Sean Carey, regarding comments on manuscript “Seasonal shifts in export of DOC and nutrients from burned and unburned peatland-rich catchments, Northwest Territories, Canada “ by Burd et al.,**

Comments to the Author from Editor, Dr. Sean Carey:

*Dear Authors,*

*I would like to thank you for this important contribution to the special issue on understanding and predicting Earth system and hydrological change in cold regions. This paper presents important new insight and information regarding the biogeochemistry of two peatland-dominated systems in Canada's Northwest Territories. The blending of high-frequency absorbance data with flow, solute and  $^{14}\text{C}$  data is particularly novel and improves upon our conceptual models in this region. In addition, the limited influence of fire on DOC was also an important observation.*

*In my final review of the manuscript, I have one issue that I believe the authors should reflect on to either temper their statements and/or delete from the manuscript as I do not believe it is of large importance and compared with the other work is overly speculative. Using a relatively weak Q-DOC relationship, historical DOC yield is calculated (1005-2015). On page 14, a value of  $2.2 \pm 0.9 \text{ g C m}^{-2}$  is given and in the discussion (page 21, line 24) this ranges from 0.6-5. While I believe that these are for different periods of the year, my concern is that there is a real possibility (and literature support) to suggest that Q-DOC relationships are not steady and shift with wetness, seasonal delivery of precipitation, etc. The year of the study was comparatively dry in the late season compared to the long-term data which often shows a very wet late summer/fall which would have large implications on this relationship. The last two sentences in the paragraph beginning on page 21 line 18, particularly the last one regarding the sensitivity of these watersheds compared to other boreal ones, I believe are too strongly stated based on the data here. I would ask the authors to consider my concerns in a final manuscript.*

*Sean Carey, McMaster University*

Our response:

Thanks for the comments. We have made a number of changes to take these comments into account.

We have removed the analysis of historical DOC yields based on the Q-DOC relationship, from the methods section, as well as the two places in the results and discussion as mentioned above in the comment. We have kept a softer statement on the potential influence of climate change on DOC and nutrient yields due to altered runoff generation in the discussion, this section now reads:

**The dry climate of the study region restricted the cumulative catchment DOC yield to  $< 2 \text{ g C m}^{-2}$  for the study period, which is substantially lower than the range 4 to  $15 \text{ g C m}^{-2} \text{ yr}^{-1}$  found for boreal catchments in other regions with similar peatland coverage (Lamontagne et al. 2000; Olefeldt et al. 2013b). Runoff during the 2016 study period from the Scotty Creek catchment was 85 mm, below the long term (1995-2015) average of 125 mm for the same period. However, the long term record also**

shows that the region has a very large inter-annual variability in runoff generation, with a range in annual runoff between 30 and 330 mm. This large variability is likely a consequence of the balance between precipitation and evapotranspiration in this dry boreal climate, where even small variability in either precipitation or evapotranspiration causes relatively large variability in runoff. Climate change thus has a large potential to cause altered runoff patterns in the region through altered precipitation or evapotranspiration, which would also strongly influence catchment yields of DOC and nutrients.