

# **Hydrometric measurements in peatland-dominated, discontinuous permafrost at Scotty Creek, Northwest Territories, Canada - Changing Cold Regions Network (CCRN) Special Observation and Analysis Period (SOAP)**

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## **Response to Anonymous Referee #1 Comments**

10 **Authors' Comments are in bold and denoted with 'AC'.**

The presented dataset covers soil temperatures, soil moisture and ground heat fluxes as well as meteorological variables for multiple landscape elements within the Scotty Creek catchment, Canada. The data covers about 1 year and looks interesting from the presented figures. Unfortunately, I couldn't judge the data itself as it is under embargo until 2019 and I did not have the time nor the intention to disclose my anonymity to go and ask for the data as suggested in the data-repository. Therefore I can't really review this dataset except for the presented figures. Overall, the manuscript is well written and the relevance of the dataset is clear from the introduction. However, why exactly the authors chose to present this data (the year 2015) from an ongoing measurement effort since 1990, and if more data is or becomes available, does not become clear from the manuscript.

20 **Authors' Comment (AC): We thank Anonymous Referee #1 for their positive comments.**

**Access to the data is granted following registration for log-in information including during the embargo period. As we understand, this aligns with the Earth System Science Data journal Repository Criteria, which specifies that "a usual registration to get a login free-of-charge" may be in place to gain access to the data. This simple registration was put in place to monitor use of our data and facilitate the potential for collaborative research.**

**We have selected to present the data from only the 2015 water year (1 October 2014 to 30 September 2015) as this year represents the Special Observation and Analysis Period (SOAP) established by the Changing Cold Regions Network (CCRN), as we mention throughout the paper. A main goal set forth among the participants of the CCRN at the conclusion of the initiative (completed March 2018) was the publication and synthesis of hydrological and meteorological datasets from study sites across the network over a**

common time frame. Facilitating this coordination of CCRN SOAP datasets is the Earth System Science Data “Water, ecosystem, cryosphere, and climate data from the interior of Western Canada and other cold regions” Special Issue, to which this Brief Communication was submitted. The overarching objective of the synthesis effort, for which all CCRN datasets will be available, is to examine the spatial and temporal variability in local hydrological responses to meteorological influences across cold regions. We aim to clarify our justification for the selection of this year of data in the revised manuscript on Page 3 Lines 4-5.

The data seems of high quality although they also raise questions: - What were the research goals for collecting the presented data in the first place? This does not become clear from the introduction. - Data quality and data gaps are not addressed in the manuscript (% of time coverage, number of gaps etc), except for page 4, line 8,9 that states that some gaps exist. - Why doesn't the soil temperature in the bog go below zero, while ice lenses forming in bogs are quite common. Is this data correct?

**AC:** As mentioned in the Introduction of the manuscript, field research has been conducted in the Scotty Creek basin since the mid-1990s, with year-round monitoring since 1999. The aim of this long-term and ongoing research is to explore the dominant hydrological processes occurring in the discontinuous permafrost landscape and examine how permafrost thaw is changing the routing and storage of moisture in this landscape. Research has also been, and continues to be, undertaken to investigate the impact of natural and anthropogenic disturbances on hydrological cycling in this region, including the impacts of forest fires and the cutting of linear disturbances (*i.e.* seismic lines and winter roads) for transportation and resource exploration. Year-round hydrological and meteorological monitoring is conducted with these objectives in mind. The dataset presented in this manuscript represents one year of annual measurements from the representative land cover types of the Scotty Creek headwaters (bogs, fens, peat plateaus) and includes data from instrumentation monitoring linear disturbances (seismic lines and former winter roads). This is reinforced in the revised manuscript.

In terms of data gaps, the only gaps in data from the micrometeorological stations appear in the channel fen record, due to the programming and power issues mentioned in the manuscript. The period of available data from the channel fen micrometeorological station is evident in the plots of Figure 2. Given the length of the channel fen station gap, no attempt was made to gap-fill. Additionally, the bog soil moisture and temperature record at 10 cm below the ground surface ends approximately 2 months prior to the end of the annual record due to a sensor error. This data gap is mentioned in the revised manuscript. No other data gaps occurred during the presented dataset.

The ground temperatures at 10 cm below the surface in the bog reach a minimum of  $-0.2^{\circ}\text{C}$  during the winter months. There are no errors in this dataset. This trend is reinforced by a similar trend in ground temperature measured in association with the soil moisture measurements and are presented in Figures 3a and 3b. The soil moisture data presented in Figure 3b suggests that the bog does indeed freeze at both 10 and 20 cm. The temperature at these depths remains relatively isothermal over winter as additional energy loss from the bog is consumed as latent heat to freeze the water underlying the freezing front.

**Measurements from drilling observations in late winter confirm a typical re-freeze depth of 20-30 cm in the bog.**

5 Minor comment: Page 1 line 15 Micro... Presented. Multiple interpretations possible.

**AC: This statement has been clarified.**

Please rephrase. Page 2 line 21 collapse -> collapsed. Explain a bit more here.

10 **AC: The word 'collapse' in this sentence is associated with the term 'collapse scar bogs' and therefore should not be 'collapsed'. Collapse scar bogs are common thermokarst features in permafrost peatland environments. These features are located within raised peat plateaus as the underlying permafrost degrades. Collapse scar bogs typically function as depressional storage features on the landscape, as raised permafrost surrounding the bogs prevents flow. The definition of a collapse scar bog has been incorporated into the sentence on Page 2 Lines 18-19.**

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