

## ***Interactive comment on “Meteorological, soil moisture, surface water, and groundwater data from the St Denis National Wildlife Area, Saskatchewan, Canada” by Edward K. P. Bam et al.***

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### **AUTHORS RESPONSE TO REVIEWER 3**

The authors reply (AC) to reviewer (RC)

Interactive comment on “Meteorological, soil moisture, surface water, and groundwater data from the St Denis National Wildlife Area, Saskatchewan, Canada” by Edward K. P. Bam et al. Anonymous Referee #3 Received and published: 2 January 2019  
General comments RC1: The data set for St Denis NWA is very useful as it represents an unusually complete set of variables for the region. The atmospheric data are at

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high frequency, and include variables such as the turbulent fluxes, which are rarely found. The many researchers who laboured to collect the data are to be thanked for their hard work, as are the authors who have collected and presented the data sets. Unfortunately, the writing is marked by vagueness and colloquialisms. The following terms need to be fixed: By “average” you are usually referring to mean values. Use of the words “high” and “low” is colloquial, unless you mean some type of elevation. You are referring to things which are either “large” or “small” Comparative words like “colder”, “higher”, or “greater” imply that you are comparing a value to another value, which in many cases is not specified. This needs to be fixed. AC1: The authors are grateful for the comments by the reviewer and have made necessary changes to the language. Specific comments RC2: Page 1 Line 21 “ground elevations (datum) used”. The term “elevations” is plural; “datum” is singular. AC2: This sentence has been edited for clarity. RC3: Line 29 “dominated by glacial till, as well as coarser grained fluvial deposits,” This implies that the fluvial deposits are coarser than the till. RC3: This sentence has been edited to convey that there are sand/gravel deposits within the glacial till. RC4: Page 2 Line 2 “ponds that annually dry out” A better phrasing would be “ponds that dry out annually” Line 3 “Farming practices over the past century include widespread artificial wetland drainage in some portions of the region.” This statement should be backed up by a reference. AC4: Reference added. RC5: Line 6 “The site was selected because it was primarily a cultivated...” A better phrasing would be “The site was selected primarily because it was a cultivated...” AC5: Agreed and fixed. RC6: Line 12 “No wetland drainage has occurred on the site since 1968.” Did any drainage occur before this year? Line 27 “The area is hummocky” Which area? This is a poor word to use, as “area” has a mathematical meaning. Do you mean the general region, or the NWA? AC6: We mean both NWA and the region near the NWA. The sentence has been revised. RC7: Line 28 “for which detailed Lidar elevation data are available.” Is this dataset available to other researchers? I don’t see it in the provided data sets. AC7: We have added the LiDAR DEM data to the open dataset and included a short description of the dataset in a new section 8. RC8: Page 3 Line 1 “In the past 50 years”

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Would be better to replace “In” with “Over” as the activity continues to the present. AC8: Accepted, replaced RC9: Line 11 As there are 2 stations, the word “oldest” should be replaced by “older” AC9: Ok, replaced RC10: Line 20 Insert the word “energy” after “turbulent” as the carbon fluxes are also turbulent. Insert the word “solar” after “net” to identify the type of radiation. Also, insert a dash between “all” and “component” AC10: Ok, replaced RC11: Line 24 The manufacturer of the logger is specified in Line 26, so it should be included here, too. AC: Ok, replaced. RC12: Line 26 According to Table 1, and to the headers of the .csv files, the “precipitation” data are actually tipping bucket rainfalls – why would they be corrected for the effects of wind speed on snowfall? Please insert a complete description here of the data. Referring this data as “precipitation” is very confusing. AC12: This paragraph has been changed to indicate that the precipitation data is measured with tipping bucket gauges, which only provide accurate rainfall data. This is why we call the data ‘rainfall’. We have removed the word ‘precipitation’ from this description. However, the data we provide is raw and covers the entire year. Users will need to determine the precipitation phase using other data. RC13: Page 4 Line 7 Replace “second” with “other” before “snow survey”, as the other snow survey site was not numbered. AC13: Ok, replaced RC14: Line 27 “Generally, monitoring typically” Pick one, either “generally” or “typically”. AC14: agreed and change effected. RC15: Page 5 Line 4 “in (Conly et al., 2004)”, should be “by Conly et al. (2004)” AC15: Ok. RC16: Line 19 “For the wetlands” This is not required – delete. AC16: Ok, deleted. RC17: Page 6 Line 2 “During soil freezing the dielectric constant of ice is much lower than that of liquid water, so the instrument is likely to give a reasonable measure of the liquid water content” This sentence is problematic. It is unclear whether you are referring to the liquid water phase in frozen soils or to the completely unfrozen soils. It needs to be re-written. Replace “lower” with “smaller” Insert “more” between “is” and “likely” AC17: The sentence was rewritten for clarity and refers to the liquid phase in frozen soil. The new sentence reads, “In frozen soil, the dielectric constant of ice is much smaller than that of liquid water, so the instrument is more likely to give a reasonable measure of the liquid water content”.

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RC18: Line 3 What does the number in “229 probes” refer to? Is it the number of probes that were installed, or is it a model number? AC18: The “229 probes” here refer to the name of the heat dissipation sensors which measure the soil matric potential. The sensor is manufactured by the Campbell Scientific, Canada.

RC19: Line 14 “shallow high permeability weathered till layers” I think that it is important to indicate that the high permeability is relative to other types of till, so it would be a good idea to insert the word “relatively” before “high” AC19: Ok. RC20: Line 27 “Stables” should be “Stable” AC20: Ok. RC21: Page 8 Line 4 “There is little lag in net radiation” What does this mean? What it is lagging with respect to? Are you saying that there is little seasonal lag between the incoming short-wave radiation and the net all-wave radiation? AC21: Yes, that is what we are saying, and we have edited the sentence for clarity. RC22: Line 6 “Wind speeds average ...” Over what time periods? Are these daily values? AC22: This is the mean of hourly wind speed over the period of record. This has been clarified in the text. RC23: Line 20 “Wetlands 1, 50 and 109 are representative of prairie wetlands” What do the other ones represent, mountain wetlands? AC23: We have rephrased this sentence to avoid confusion. RC24: Line 28 What is the “freeze back”? I am not familiar with this term. AC24: The sentence was rephrased for clarity. The new sentence reads, “The frost table depth is also affected by antecedent soil water content”.

RC25: Line 29 “The saturated water content at freeze-up is usually 0.5” What does this mean? What is the saturated water content 0.5 of? Do you mean that the saturation fraction is 0.5? AC25: The ‘fraction’ term was added in the sentence. The new sentence reads, “The saturated water content fraction at freeze –up is usually 0.5 with a high residual of liquid water content during frozen conditions”.

Figures RC26: Figure 1 The soil moisture profile points near Pond 109 are so large that they overlap, so it is hard to see them all. It would be better to use smaller markers. AC26: We have added an inset detail map to the figure to show the soil moisture profiles near Pond 109. The profiles are too close together to show with non-overlapping

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markers at the scale of the site map unless the markers are so small that they become difficult to see. RC27: Figure 2 This figure is not referenced in the text. Which set of air temperatures is plotted, the 2m or 5m? Please include the elevation, or the name of the site in the y-axis label. Also, include the time-step of the values plotted, i.e. either daily or monthly. If you are going to refer to a value as a flux (the evaporation and precipitation) then it needs to have the units of a flux, i.e. as a mass (or depth) per unit time. It looks like you are plotting values which are accumulated over a time. The axis title in the bottom-right plot is confusing. As it states "Month", it implies that monthly values are plotted. It might be better to title it as simply "Date", as these are daily values. You could indicate the date format as "(Year-month)", if you like. AC27: We have added a reference to this figure in the text in the Overview of content section. The figure has been revised showing temperature indicated in the plot was obtained at 2m.

RC28: Figure 3 The black line is the mean value. The use of the word "average" is confusing as a) it is incorrect and b) the individual SWE values are weighted averages. AC28: Ok. RC29: Figure 4 "Hydrograph" should be plural. AC29: Ok. Data sets RC 30: The headers of the isotope .csv files contain non-ASCII characters, which are problematic for many programs to read, particularly as there is no indication as to how the files are encoded. It would be a good idea to change these characters to their closest ASCII equivalents. AC30: Ok.

Interactive comment on Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2018-125>, 2018.

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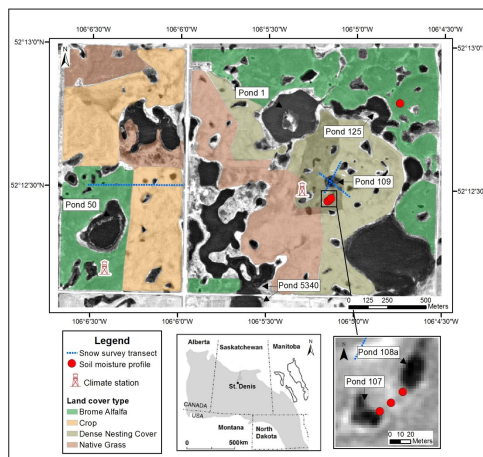


Figure 1: Map and location of St. Denis National Wildlife Area. The grey area on the inset map represents the extent of Prairie Provinces Region in North America.

Fig. 1. Figure 1: Map of study area

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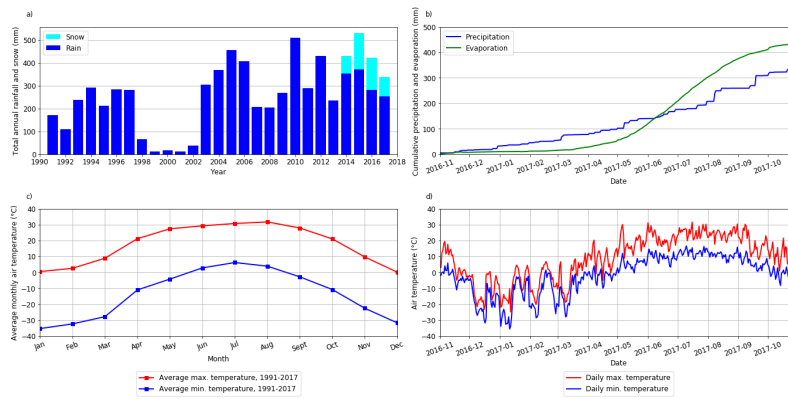


Figure 2: Meteorological data from SDNWA: a) the total annual rainfall for the period of record (1991-2017) and annual snowfall (only available 2014-2017); b) cumulative total precipitation (rain and snow) and evaporation for the 2016-2017 hydrologic year; c) mean monthly air temperature at 2 m for the period of record (1991-2017); and d) daily air temperature for the 2016-2017 hydrologic year.

**Fig. 2.** Figure 2: temperature -precipitation plots