

Interactive comment on “An 11-yr (2007–2017) soil moisture and precipitation dataset from the Kenaston Network in the Brightwater Creek basin, Saskatchewan, Canada” by Erica Tetlock et al.

Anonymous Referee #1

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The manuscript refers to a 11 year dataset of soil moisture, soil temperature and precipitation from more than 50 sites within a 1600 km² region collected during the growing season for an agricultural prairie landscape.

GENERAL COMMENTS The manuscript and dataset are of value to those involved in soil moisture research. Aside from small errors the manuscript is of appropriate length and reasonably clear. The data set is well organized and consistently structured. The data is unique and very useful, especially as the dielectric value and soil temperature is provided, and its coverage of 11 years. The dataset is presented in a usable format (checked with R and Excel). Sufficient background is given on sensors and usage.

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Before publication the manuscript requires numerous, but minor, improvements (see Specific Comments), and the data set requires further quality improvements.

The dataset presented is limited to May thru Sept although it appears that year-round data is available. Although the dielectric value of soils is strongly affected by freezing it can still be of value to researchers, especially if soil temperature of the probe is given. For example, see Kelleners and Norton, 2012 (Soil Science of America) and Roy et al 2017 (Remote Sensing of Environment). Both studies used Hydra probes. If available it is recommended that the entire year-round data set be made available, with appropriate caveats given about freezing conditions.

Dataset needs further quality control: high moisture content values greater than 0.60 m³/m³ are present and in one known case greater than 1.0 m³/m³; moisture content fluctuations between 30 minute intervals for many probes (especially at 20 and 50 cm) are greater than acceptable (>0.02 m³/m³ and up to 0.10 m³/m³). Although the fluctuations are stated as being caused by possible salinity it was not made clear by the authors whether they were to be kept or removed from the data set. They should be kept and clarification (and caveat) statements need to be added. Additionally, some data sets do not extend up to the years indicated in Table 1 (e.g. they only go as far as 2010, not to 2013).

There is confusion around the terms 'two spatial scales' and 10 km² and 40 km². Spatial scale implies different spacings or densities. The areas measure 10 km by 10 km and 40 km by 40 km thus are more 100 km² by 1600 km² in area. Perhaps referring to density of the stations per km² or their average spacing would provide more information for the reader. The authors refer to the manufacturers loam setting being used to calculate the moisture contents, however this 'loam' equation cannot be found in the provided references.

SPECIFIC COMMENTS/QUESTIONS 3:67-70, confusion with sensor locations; make it clear in the text and in Figs 2 and 3 which probes are set within the tilled field and

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which in the field edge. Lines 67 to 68 (5 cm, 20 cm, and 50 cm) do not state location, however Figures 2 and 3 indicate the 20 cm and 50 cm are within the tilled field. Also Figure 2 states “(3) location of vertical 0-5 cm sensor during off season”. This implies the sensor is still active and recording or it is ‘off’? Clearly indicate this in text. 4:85, give length of tines 4:102, why not publish the calibration equations in the paper or on the data web site? What is the degree of moisture difference between the calibrated probes and that given by the manufacturer? 5:118, some confusion about that of electrical conductivity (EC) measurements. Do Hydra probes measure EC? If so, was this measured by the installed probes? If it was measured, then it should be mentioned in the text and rational given as to why it is not published – as it appears it might be useful in discerning problem readings which are in the data set (e.g. site 2701023 50 cm probe). 6: 149-150, and Table 3 gives a flag for soil moisture not being greater than 0.6 m³/m³, however many data sets have values greater than this at various depths (e.g., 2701023 at 50 cm). Were these to have been removed? If so then please check all data sets. If they are to stay in then clearly indicate so. 6:155, the manuscript does not indicate which set of sites were the ‘dense set’. When were the soil moisture and precipitation sites established? This should be stated in the paper and not in the Summary. Are they still maintained and visited? How often were the sites visited? The document states ‘regularly’ however is this once a year or 5 times? Table 1 shows Data records up to 2017 – does this mean the data was not collected after 2017 or is this when the table was compiled? Figures 2 and 3; make it clear that only the ECCC sites (the dense network) have the vertical 5 cm sensor in the agricultural field. As indicated by the authors some of the data is more variable than expected (e.g. possible saline conditions at 20 and 50 cm depth, see lines 119-122). Although it is stated on lines 168 to 169 that erroneous data is removed from the final data set there are numerous instances of ‘unexplained drops and unusually high or low values’. If some of the values retained are due to possible saline conditions then it should be clarified that these values were kept but the user must be careful about their interpretation. See Technical Corrections for examples.

TECHNICAL CORRECTIONS 1:21, insert 'the' before 'hydrological cycle'. For clarification change the following: "While soil moisture constitutes a small portion of the global water cycle, it has a...". 2:43, As this is an international journal add the following "...a typical prairie agricultural..." to help define 'typical'. 2:46, 'considered'. 2:46, remove 'in general'. 2:47, incomplete sentence – suggest the following "Texture of the soils in the region is predominantly silt loam but ranges from sandy loam to clay.". 2:49, remove 'over the years'. 2:53-55, Do the references given in line 55 refer to the 2010 (CanEx-SM10) study? If not then perhaps create two sentences. Remove 'previous' as not necessary.. 3:57-58, clearly state that the AAFC stations are not included in this data set. 3:67, add an 's'; "Additionally, sites at ...". 3:68, insert 'the' before "site at the...". 3:71, "...vertically placed probe,..." add the 'd' to place. 3:73-74, "the sum over the '30 minute' interval for the TBRG.". 3:76, "...within the Kenaston network, ...". 3:79, "and to check for ". 3:79, "Sites with a vertically...". 4:84, there is no Stevens Water Monitoring Systems Inc 2009 or Burns 2016 in the Reference list. Why the double parenthesis – is Burns 2016 a reference within the other? 4: 99, Burns et al 2014 is missing in the reference list (or year not given). 4:102, always provide a space between the value and the units; e.g. "5 cm". Check through the manuscript for this. 4:117, what is a 'timestamp' ? Is this the 30 minute interval? 4:137, replace 'currently' with a date or at least a year as the article can be in existence for much longer than the network. 5:130, why 'regularly' completed? Were calibrations required every year or so or just once? What about the RG3's – did they require calibration? 5:137, reword removing 'at maximum' as this is too confusing when referring to dates. 8:195, a year is needed for the first Burns et al reference. Table 1, should indicate which site is ECCC and which is Guelph (using same terminology in Figure 1). Table 1, Note at end, "Onset RG3 and ..." insert space. Table 3, if Conductivity refers to soil Electrical Conductivity it should have units, e.g. dS/m

Dataset web pages: 'moisture' is repeatedly spelt wrong in the 'Readme' file. Below are some of the issues found with the data sets. Not all data sets were investigated. V2701000 for 2007; H5 cm probe varies by 0.02 up to 0.1 m³/m³ each time interval so

it appears that there could be a choice of three possible sets of data to choose from each day. This type of fluctuation appears to be common for most probes with the range of fluctuation becoming greater at certain moisture contents and more so at 50 cm depth. Could be a function of both the Hydra probe and salinity?? 20 cm probe has values greater than 1.0, (July 2007) likely because the dielectric values are greater than 100. 50 cm probe has values vary by more than 0.1 m³/m³ within each day. V2701001 and V2701002 something with the dates that R did not like. V2701003 had no data from 2011 on (Table 1 states data from 2007-2013). V2701004, 50 cm VWC varies too much and no data present from 2011 on. V2701005 data appears reasonable in values and range. No data present from 2010 on. V2701006 data appears reasonable in values and range. No data present from 2011 on. V2701023, 50 cm probe has high range of daily fluctuations and values greater than 0.60 m³/m³. V2701025, 50 cm depth has a strange fluctuation that when plotted over the season it appears to have three distinct sets of data. This is not seen for the other sensors of this site. Many dielectric values are high and some sensors show very little response to seasonal rains or drying events. V2701034 has values > 0.60 at the 20 cm depth. At 50 cm depth moisture readings indicate saturation (0.50 or higher). V2701035 has values > 0.60 at the 50 cm depth

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