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Interactive comment on "The Cariboo Alpine Mesonet: Sub-hourly hydrometeorological observations of British Columbia's Cariboo Mountains and surrounding area since 2006" *by* Marco A. Hernández-Henríquez et al.

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RESPONSE TO ANONYMOUS REFEREE 2

We sincerely thank Anonymous Referee 2 for the constructive comments on our manuscript (Reference ESSD-2018-45). We fully recognize and appreciate the reviewer's efforts in providing this informative report on our hydrometeorological network and dataset for the Cariboo Mountains of British Columbia (BC). Indeed, these insights will undoubtedly lead to an improved paper through this online discussion and ensuing

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revision process. We are thus taking into full consideration all of the comments from both Anonymous Referees 1 and 2. To that end we are preparing detailed responses to these as well as information on how the paper is being revised according to the referees' suggestions. A complete and detailed response document will be submitted once a decision has been reached on our discussion paper. In the meantime, we provide here a general overview of our responses to the comments submitted by this referee in the following paragraphs.

First, thank you for your general positive overview of our manuscript. We agree this mesonet plays an important role in filling a major observational gap in the otherwise poorly monitored Cariboo Mountains and surrounding areas of BC. Given the remote and often harsh environment in which the Cariboo Alpine Mesonet (CAMnet) weather stations are deployed, maintaining homogeneous and high-quality time series remains particularly challenging. Nonetheless, every effort is made in maintaining the integrity and homogeneity of the dataset and assessing its quality. Indeed, a considerable amount of effort has gone into the deployment and maintenance of the weather stations, in compiling and quality controlling the data, and in making the datasets available online; hence we thank the referee for acknowledging the extent of these efforts.

Second, in response to the referee's request, we will include a new subsection (4.6) under "Data collection" to provide some examples of the CAMnet data. Here we will demonstrate illustrative case studies of, for example, high wind events and/or strong inversions recorded at CAMnet stations. Another point raised by Referee 1, echoing comments from Referee 2, is the potential to add climate summaries for the CAMnet weather stations. Despite the potential usefulness of the addition of climatological results to the paper, this would be beyond the scope of the present effort and the journal's purview. Instead, we refer the reader to other studies that have reported some statistics on the hydrometeorological variables collected at CAMnet stations (e.g., Déry et al., 2010; Sharma and Déry, 2016). A future effort will develop a comprehensive climatology of hydrometeorological conditions recorded at all CAMnet weather stations

and will be reported in a separate paper. Nonetheless, as requested by the referee, we will provide a profile of air temperatures along a transect across the Quesnel watershed based in part on CAMnet weather station data (see later comment to this effect).

Thank you as well for recommending publication of the paper with minor revisions. The following paragraphs provide additional responses to comments on the various sections of the manuscript and the technical recommendations as well.

Introduction:

In revising the manuscript, we will provide additional information on the importance of CAMnet such as stating explicitly the density of active weather stations in this region (although that information can be derived from Figure 1 and the total area of the Cariboo Mountains (44,150 km^2)). Indeed, there are currently 49 active weather stations in the Cariboo Mountains, equivalent to a density of 1.1 station per 1000 km^2, well below the range of one station per 100-250 km^2 recommended by the World Meteorological Organization (Miles et al., 2003). This is also less than the observational density seen in other regions of Canada or globally (e.g., in Switzerland; Gubler et al., 2017). There are indeed many potential applications for the CAMnet data, including those mentioned by the referee, and we will add this information to the Introduction.

Study Area:

There is strong seasonality in meteorological conditions in the Cariboo Mountains and a graph illustrating a transect of climatological conditions will be added to the paper in the new Section 4.6. Information on the six biogeoclimatic zones found in the Quesnel River watershed will be added to the paper. These are: 1) Boreal Altai Fescue Alpine; 2) Interior Mountain – Heather Alpine; 3) Engelmann Spruce – Subalpine Fir; 4) Interior Cedar – Hemlock; 5) Sub-Boreal Spruce; and 6) Sub-Boreal Pine – Spruce (https://www.unbc.ca/quesnel-river-research-centre/quesnel-river-watershed).

While of interest, a hydrograph of the Quesnel River will not be added to the description

of the study area, as this information is readily available through other sources (e.g., Burford et al., 2009) and detracts attention from the primary focus and purpose of the paper.

Hydrometeorological Stations:

Additional information on the frequency of site visits will be added to this section. All CAMnet weather stations are visited at least once a year, but repeat visits are not feasible at the most remote sites (i.e. Upper and Lower Castle Creek Glacier weather stations) given access is often by helicopter. All other sites, however, are usually visited two to four times a year, while others such as the Quesnel River Research Centre (QRRC) and Ness Lake are easily accessible and thus serviced much more frequently.

As of 1 January 2018, there were five active weather stations (QRRC, Spanish Mountain, Browntop Mountain, Plato Point and Long Creek) in the Quesnel watershed, while two others (Upper and Lower Castle Creek Glacier stations) are just outside the watershed boundary. Section 3.1 will be revised to better set up the discussion that follows on the chronological development of CAMnet.

Chronological Development:

We respectfully disagree with the referee's comment in regards to the structure of this section, and will retain the existing one. Otherwise this would complicate the discussion given some stations were at times relocated from one site to another, such as the Blackbear Mountain weather station to the Upper Castle Creek site in 2007, just outside the boundary of the Quesnel watershed. Apart from the sites in and near the Quesnel watershed, there is no other geographical cluster of weather stations, and as such it would be difficult to rearrange this section as proposed. Keeping the numbering of the weather stations in a chronological order also facilitates tracking the development of the network.

Elevations for each of the stations is already provided in the text along with Table 1,

and such we refrain from duplicating that information in parentheses each time a specific location is sited in the text; however, we will add this information to Figure 4 as requested below.

Precision and Accuracy:

Calibration for most of the instruments including the tipping bucket rain gauges is performed by the supplier, Campbell Scientific and in our lab. We do attempt to be proactive in swapping instruments before they fail but often times this is not possible given tampering by animals or damage in extreme weather events. There is indeed the regeneration of vegetation at one field site, Spanish Mountain, which has led to an overall trend towards lower wind speeds there. That station therefore is only representative of a regenerating cutblock, which are common in the Cariboo Highlands. The suggestion of taking fish-eye photos or drones to take an aerial view of the sites will certainly be considered; note that we maintain an extensive library of digital photos taken at each site during each visit allowing comparisons of ambient environmental conditions over time including tree growth.

Technical:

Page 2, lines 11-13: The appropriate references will be added here (Hasler et al., 2015; Allchin and Déry, 2017; Beedle et al., 2015).

Page 3, line 1: The actual number of stations will be inserted here instead of “over a dozen”.

Page 4, line 16: A link to the QRRC will be added (http://www.unbc.ca/qrrc).

Page 6, line 22: We will replace “sonic ranger” with “SR50”.

Page 7, lines 2 and 7: The two stations near Castle Creek Glacier are named relative to their elevation, i.e. either ‘lower Castle Creek Glacier’ at an elevation of 1803 m a.s.l. or ‘upper Castle Creek Glacier’ at an elevation of 2105 m a.s.l. Given these are site names, we will henceforth use upper case letters when referencing them, i.e. ‘Lower

Castle Creek Glacier' and 'Upper Castle Creek Glacier'.

p. 7, line 8: Temperature, humidity and wind speed are measured at 4.1 m and 2.7 m above ground at the Lower Castle Creek Glacier station.

p. 8, line 2: We will add Stevenson et al. (2011) as a relevant reference to the Ancient Forest.

p. 13, line 23: An appropriate reference for the radio signal range will be added here.

pp. 33/34, Figure 4: We will add the station elevations on this figure.

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