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Interactive comment on "Inconsistency in precipitation measurements across Alaska and Yukon border" *by* L. Scaff et al.

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Originality: The scope of the manuscript is well suited for The Cryosphere. This paper compares precipitation data from 3 gauges located in the Yukon Territory, Canada, with precipitation data from 2 gauges located in northern Alaska, USA. Both solid and liquid precipitation are considered in this comparison. The main finding of the paper is that monthly and yearly precipitation amounts are inconsistent between U.S. and Canadian stations along the Beaufort Sea coast. This inconsistency is attributed to the differences in instrumentation (precipitation gauges) between two countries.

Scientific quality: The purpose of this paper - to identify and quantify inconsistency in precipitation measurements - is well articulated. The methodology involved correction of systematic biases and a comparison of measured and corrected monthly and an-

nual precipitation data between different stations using regression analysis and double mass curves.

Inconsistency in monthly and yearly precipitation can be attributed to several major factors: (1) differences in gauge performance, (2) the amount of missing data, and (3) natural variability in precipitation. Though the authors have most certainly considered all these factors, only one factor (gauge performance) is discussed in the current version of the manuscript. To omit discussion of the two other factors is a shortcoming that needs to be addressed.

Factor 2 is important because of the low quality of precipitation data in the Arctic. Many days of missing precipitation data would lower the monthly and annual sums of daily precipitation and, therefore, introduce inconsistency between the different stations. It might be helpful to add a table or a plot showing the percentage of missing precipitation data each year, for each station. The information in such a table or plot would either address my comment or raise a discussion on another aspect of inconsistency.

Factor 3 is based on the observation that if two stations with different precipitation gauges are located very close to each other, the inconsistency in records is clearly attributed to gauge performance. This requirement of geographic proximity might hold for the Eagle and Dawson stations, but the northern stations are located on different sides of the Brooks Range, long distances apart (143 km and 138 km apart, shown in Figure 7). Please discuss the inconsistency in monthly and annual precipitation received by the northern stations in terms of the stations' proximity to the Brooks Range and to each other.

Significance: This manuscript represents a significant interest in the regional analysis of precipitation and climate in northern regions. I recommend acceptance of the manuscript once the above-mentioned points are carefully addressed.

Presentation quality: The paper is well structured and clearly organized. The text reads well, and the authors' logic is easy to follow. The quality of the tables and figures is

generally good, but can be improved with the following suggestions:

Table 1: Add a column with the height of the precipitation gauge and the wind sensor above the ground, similar to Table 1 in Yang et al., 1998b. This information is not publically available, but is critical input for wind-induced corrections.

Table 1, column heading “Measurement device snow”: Consider re-labeling this column “Snow gauge.” Also, include a column that describes the instrument used for the rainfall measurements.

Table 1 shows that analysis of precipitation data was performed for the two different data periods, 1978–1988 versus 2006–2013. Include a justification for the choice of this period in the text.

Figure 11 shows double mass curves without an explanation for the precipitation metric used. The addition of something like “monthly precipitation (mm) summed over the period specified in Table 1” would improve this figure.

Minor comments:

Page 4, line 7: At the end of the sentence, replace the comma with a period.

Page 9, line 11: Correct the wording “is lowers.”

Page 12, line 6–7: The verb is missing.

Page 15, lines 24–25: Consider moving this sentence to the Methods section.

Page 16, line 1–2: Consider referencing the recent paper on this topic by Kane, D.L., and S.L. Stuefer, 2015. Reflecting on the status of precipitation data collection in Alaska. Hydrology Research, Vol. 46, No. 4, pp. 478–493.

Table 1: For latitude and longitude, replace “N” and “W” with the units of “decimal degrees.”

Figure 10 and Figure 11: Consider labeling each axis with the plotted variable and

corresponding units. For example, the axis label would appear as “Monthly Pc (mm)” or “Cumulative monthly Pc (mm).”

Interactive comment on The Cryosphere Discuss., 9, 3709, 2015.