

## ***Interactive comment on “Juneau Icefield Mass Balance Program 1946–2011” by M. Pelto et al.***

### **Anonymous Referee #2**

Received and published: 26 July 2013

General comments: This paper present surface mass balance data for two glaciers in Alaska. Furthermore, the paper also presents Equilibrium Line Altitude and Transient Snowline data for the region. These data are quite valuable to the glaciological community. Furthermore, this paper should be published in ESSD, however some edits need to be considered. In general, the terminology should be revised so it is consistent with Cogley et al. (2011). Early in the MS you should state that you are talking about surface mass balance and that Ba is the glacier-wide surface annual balance (see Cogley et al., 2011). In general, if you are expressing mass balance in dimensions of  $[M T^{-1}]$  it is a mass-balance rate (e.g. the change of mass per unit of time). Below are some comments and edits that must be considered for future versions (identified by page number and line number).

Pg. 120, Ln 22: Should be specific with the use of mass balance. The measurements

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being conducted are surface mass balance. I would suggest using the terminology outlined in Cogley et al. (2011) to be consistent with the rest of the field.

Pg. 121, Ln 1: annual mass balance should be changed to annual surface mass balance since you are not considering the internal and basal components of mass balance.

Pg. 121, Ln 15: neve zone should be replaced by firn zone since it is a synonym for firn and it is rarely used

Pg. 121, Ln 22: "This refreezing results in a unique signature in SAR imagery." What is unique? Is there something unique about the backscatter in SAR imagery? Please be a little more specific.

Pg. 123: Change "3.0 Mass Balance Methods" to "3.0 Surface Mass-Balance Methods"

Pg. 123, Ln 18: remove apostrophe from "summer's surface"

Pg. 124, Ln 1: What are the current density measurements (averages, standard deviations, ect.)? Why are these data not included in the final data tables?

Pg. 124, Ln 16: "previous year's firn pack" can be "previous year's firn" or "previous year's summer surface"

Pg. 124, Ln 20: Was your sampler orientated vertically or horizontally? This makes a difference with the density measurements. Regardless it should be stated how your sampler was orientated.

Pg. 124: General comment: how were your density measurements integrated into for water equivalent depths? Are they depth averaged? Did you plot the measurements with depth and determined a best fit and used that to get your water equivalent thickness?

Pg. 125, Ln 9: There are more measurements being conducted on the USGS Bench-

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mark Glaciers, might want to consult Shad O'Neel or refer to some of their latest reports.

Pg. 126, Ln 5: average ablation should be referred to as average ablation rate (dimension  $[M T^{-1}]$ ), since it is ablation over some period of time. The following correction should be made for the entire paragraph.

Pg. 126, Ln 17: Do you have an estimation of uncertainty for the ablation in the ablation area? Since you are not using ablation stakes and extrapolating mass-balance gradients to the ablation area, what is the uncertainty? Mass-balance gradients often have a different slope in the ablation area compared to the accumulation area? This puts a bias in your mass-balance estimates. Furthermore, why do you not put some stakes down in the ablation area? This would further validate your results and alleviate much of the uncertainties associated with your measurements? Trusting a few ice ablation measurements from 9 different years is a small sample size and introduces a lot of uncertainties and skepticism in your methods.

Pg. 126, Ln 20: Avoid asking questions in technical writing. Remove and/or rephrase.

Pg. 127, Ln 19: "4.1 Annual mass balance record" should be changed to "4.1 Annual Surface mass balance record"

Pg. 127, Ln 21: Ba is the glacier-wide mass balance rate since you are expressing it as a mass change over a period of time. If this is the case, it should have a dot over the top to express that it is a rate (see Cogley et al., 2011). This correction needs to be done throughout the document and needs to be consistent. Again, you need to specify that you are talking about surface annual balance.

Pg. 128, Ln 10: The sources of errors associated with using nine years of ablation data to extrapolate mass balance in the ablation zone is significant. Any estimate on this principal error due to the lack of data in the ablation zone?

Pg. 128, Ln 26: Again, mass balance rate since you are expressing it as a mass

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change over a period of time.

Pg. 129, Ln 2:  $B_a$  is the glacier-wide mass balance rate since you are expressing it as a mass change over a period of time. If this is the case, it should have a dot over the top to express that it is a rate (see Cogley et al., 2011). This correction needs to be done throughout the document and needs to be consistent. Again, you need to specify that you are talking about surface annual balance.

Pg. 130, Ln 16: What sensor are you using? Should be stated what sensor you are using to derive the transient snow line. Furthermore, if using optical imagery, how are clouds and shadows accounted for?

Table 1: Table should include the dates when these measurements were conducted (month, day, year). Ideally, since these are annual balances, one should include a start date (e.g. the end of the previous balance year), and an end date (the date at which the annual measurement was conducted). Units for mass balance should say mm w.e. or convert to m w.e.

General data presentation: you should include the point balances as well as the density measurements for the pits for each year (if available). One should also include the measurement day, month, and year.

Figure 2. "Alaska" label in the upper left hand corner in the Alaska map is not necessary

General figure presentation: figure text and font should all be consistent.

Figure 4.  $B_a$  m w.e should be  $B_a$  (m w.e.)

Figure 6:  $B_a$  (m) should be  $B_a$  (m w.e. ) to be consistent

Figures 10 and 11: very different looking plots. Looks like it is from a different software package. Try to make them consistent looking with the others. Also the term "Net Balance" should be avoided. Annual Balance should be used instead and the unit

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label should be either mm w.e. or converted to m w.e.

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Interactive comment on Earth Syst. Sci. Data Discuss., 6, 119, 2013.

**ESSDD**

6, C59–C63, 2013

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