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Earth System Science Data Discussions

Interactive comment on "Twenty-one years of mass balance observations along the K-transect, West Greenland" *by* R. S. W. van de Wal et al.

Anonymous Referee #2

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Twenty-one years of mass balance observations along the K-transect, West Greenland - van de Wal et al

This paper, and the available dataset in particular, is extremely important as it provides a very valuable 21 year mass balance record along a transect from the ice margin into the accumulation zone of the SW Greenland Ice Sheet. There are no comparable field derived mass balance data-sets of this temporal length or quality from the Greenland Ice Sheet. As such, the dataset is without doubt significant, useful and unique. As noted by the authors, the dataset will be used by different user groups and by making it available to the wider community, the IMAU group are providing an excellent resource through a hard earned period of data collection. The writing in the paper is a little awkward in places but undoubtedly merits publication. There is one substantive issue

that requires clarification for the potential end-users of both the paper and the online data set.

Main substantive issue

The paper states that data always represent one mass balance season. A bit of clarification would help in terms of what this means. For example, if you visit a site once a year in August (e.g. Aug 2009 and 2010) and there is subsequent melt in Sept 2009 of the first year, what year is that loss attributed to? Presumably it cannot be distinguished from the majority of melt in the following summer of 2010? This issue may not be important for the general mass balance trend over 21 years but does have implications for comparisons with other data sets (e.g. summer melt estimates from regional climate models) and inter-annual variability (as late August/September melt may be considerable). This is not a criticism of the paper but I think needs clarification so that other workers do not use the data incorrectly.

Specific issues and suggested edits

Abstract - would help to add elevation of the highest of the 3 sites that experiences a significant increasing trend in ablation

P352, L10 - add a comma after “10yr,” P352, L10 – of the Greenland ice sheet HAS improved. . ..

P352, L11-14 – this is awkward as written currently. Perhaps change to “The analysis of gravity field, radar altimetry and inferometry data combined with regional climate models has contributed to this”

P352, L 15-19 – suggest editing to “Figure 1 shows the K-transect where 21 years ago, IMAU (Institute for Marine and Atmospheric research Utrecht) started mass balance observations, GPS measurements. . ..”

P353, L8 – might as well say that the record from the highest site is 4 years shorter as opposed to “a few”

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P353, L14-15 – suggest merging the two sentences "....except at the highest site where snow and firn is at the surface and density measurements are carried out."

Figure 3 – the yellow data (site 7?) is almost invisible and all the dotted lines could be made bolder

Figure 3 only appears to plot data up to the very negative 2009-10 year. Why isn't the 2010-11 year also included in Fig 3 as it is in Fig 2 and in Table 1?

Figure 3 caption – add " with no STATISTICALLY significant trend..."

P354, L22 - I think that to state that "we can conclude that on average the mass balance decreases linearly with elevation" is rather too simplistic. There is a certainly a 'general' decrease and it looks approximately linear but the wording currently seems rather loose. This is especially the case since no statistics are applied to test whether the best fit lines are indeed linear throughout the period.

Figure 4 – it would help to clarify trends in mass balance gradient if there was a gradation in the colour scale from the start to the end of the time series

P354/355 – suggest editing to "The highest ablation took place during the 2009–10 season while the lowest ablation was recorded during the 1991-92 season".

P355 L3 – "... and site 10 WHERE available"

P355L 4 – 6 – it would be helpful to have a little more information on how this height correction was applied as it is not clear from this summary.

Interactive comment on Earth Syst. Sci. Data Discuss., 5, 351, 2012.