

## ***Interactive comment on “The seasonal cycle and interannual variability of surface energy balance and melt in the ablation zone of the west Greenland ice sheet” by M. van den Broeke et al.***

**X. Fettweis (Referee)**

xavier.fettweis@ulg.ac.be

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This paper discusses the seasonal and interannual variability of the surface energy balance (SEB) along the K-Transect using one of the best measurement-based data set over the Greenland ice sheet. This paper is well written, easy to follow, pleasant to read and original. The TC journal is just right for this kind of paper. The authors show that the variability of SEB is complex and depends on the location over the ice sheet although the 3 studied sites are very close. The complexity of the ablation zone is difficult to capture by the RCMs and only a such study based on measurements is able to discuss reliably the SEB time and space variability. Therefore, I suggest to accept

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this paper for publication with the suggested additions listed hereafter if they do not ask a too big job for the authors.

My issues are:

1. pg 785, line 16: What is the threshold used to detect the melt events in the SEB time series ? If  $Melt > 0$  is used as threshold, I think this threshold could be too sensitive in respect to the precision of the measurements and errors in the SEB model and perhaps a threshold corresponding to the uncertainty in the estimation of the melt amount could be better.
2. Pg 787, line 2: It is not clear in Table 2, without a read in depth of the text, which values come directly from observation and for the SEB model. Therefore, I suggest to add an indication if the values come from the SEB model or not. It could be a star "\*" at the end of the number.
3. Pg 787, line 25: In addition to the monthly melt frequency, it should also be interesting to discuss and to show in Fig 5 the monthly melt amount in  $W/m^2$ .
4. Pg 791, line 15. The authors say that the  $SW_{net}$  explains the melt variability at S6 and S9. But is it due to changes in albedo or changes in cloudiness? I think that  $SW_{in}$  and  $SW_{out}$  should be separately discussed and shown in Fig 11. Idem for  $LW_{in}$  and  $LW_{out}$ . I think that an increase of  $LW_{in}$  could be masked by the only use of  $LW_{net}$  because an infra-red incoming radiation increase induces a warming of the surface inducing a higher  $LW_{out}$ . In addition, the MAR model seems to suggest for the whole GrIS (see Fettweis (TC, 2007)) that the increase of  $LW_{in}$  plays a larger role in the interannual variability than suggests Fig 11. However, as said in the conclusion, how are the observations here representative for the whole GrIS variability ?