

## ***Interactive comment on “An updated and quality controlled surface mass balance dataset for Antarctica” by V. Favier et al.***

**V. Favier et al.**

favier@lgge.obs.ujf-grenoble.fr

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Dear reviewer, thank you for your thorough review and your relevant comments. Please find hereafter our response to your queries.

1. You suggested including a map with the locations mentioned.

This was performed in Figure 1 a).

2. “why is isotopic data rejected (‘B’) even if the accumulation is clearly enough to separate annual layers and these layers are identified by multiple isotopic parameters?”

As you mentioned, the determination of local SMB by identifying annual isotope content variation is only valid in case the distinctive seasonal variations are preserved. As

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a consequence, defining objectively whether annual layers have been preserved (and can be easily identified) is totally crucial. We do not believe that it is generally achievable for such a large database. For instance, at Dome C, observation of stake networks suggests that erosion is present at 30% of the stakes, although the area presents a positive mean distributed accumulation every years (see Glacioclim stake data at Dome C, <http://www-igge.ujf-grenoble.fr/ServiceObs/SiteWebAntarc/dc.php>). At plateau stations, and more generally “low accumulation sites”, missing some annual layers seems rather plausible. However, even for more coastal regions (e.g., in Adelie Land the Glacioclim-Samba stake network) we observed that several stakes may present erosion during low accumulation years, even if the mean accumulation there is around 300 mm w.e.a-1. As a consequence, dating techniques based on layer counting does not offer absolute ages, and were rated “B”. However, it should be noted that “B” rated data are not rejected but conditionally accepted. Because all the data are available in the full database, it is suggested that scientists perform their own quality control on the data. In this paper we decided using only the “A” rated data, because this option was the more restrictive and less subject to discussion. However, a similar analysis may be done with less restrictive criteria.

### 3. “Do you see possibilities to include data using ground penetrating radar (GPR)?”

Including GPR data is a work in progress, and data will be included in an additional associated database. However, the main problem of GPR is that -unlike stake measurements for example- it is an indirect measurement of SMB, thus requires an interpretation which could lead to errors. Difficulties in signal processing or in signal interpretation and picking of the reflectors are the main possible sources of error (Verfaillie et al., 2012). Even if radargrams are available in figures, the age of reflectors is generally not identified in publications. Hence, performing a database using GPR requires an important post-processing of the data after their collection. This also requires that researchers, who performed GPR measurements, offer a complete access to the data. This data collection is under process by NASA (SUMup working group – PI: Lora

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Koenig). Including GPR data was beyond the focus of the present paper which only focus on direct SMB estimations. We will include the data once the NASA publish their database. A short discussion is included in the text on this point.

4. In Figure 4a, you suggest adding a third quantity here, the distribution of points covered by observations.

We added such a material to Figure 4a.

5. In particular, you suggest rewriting this first paragraph and changing the sections of the paper.

This was performed.

6. You “don’t understand whether ablation observations are excluded from traverses, or that traverses with blue ice areas are excluded.”

In ERA-Interim, erosion is not considered. Because this is the essential process acting in blue ice (BI) areas, any comparison would locally necessarily fails and may add a significant bias to our statistical analysis. Indeed, the number of available data in each elevation range is low, and therefore the impact of each data on the mean SMB for a given elevation range is pretty high. SMB values in BI areas are very local and probably overrepresented and therefore significantly affect the final calculated mean. However, it is worth noting that using ERA-Interim data makes sense in other areas, where erosion is only a second order term for mean meso-scale SMB values.

7. P 3672 L20-22: The current use of both snow and ice in this comment is unclear. Since the density of ice is well known, the comment between brackets makes this information appear to be non-crucial.

This sentence was removed.

8. You suggest a reformulation of the discussion on the better overall estimate of Antarctic SMB. Because it states that field data are required, but no additional com-

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ments are made about that. Furthermore, it makes little sense to discuss future papers or work that others should do.

The second reviewer also asked for more details on how we can improve the set of available data, because he found that this is not straightforward. We therefore added a short paragraph in section 5 to give more information on how the existing knowledge gaps can be filled and how the presented dataset can be used.

9. Figures were adapted as proposed by reviewer 1

10. Other minor comments

Every minor comments were considered and included.

References:

Verfaillie, D., Fily, M., Le Meur, E., Magand, O., Jourdain, B., Arnaud, L., and Favier, V.: Snow accumulation variability in Adelie Land (East Antarctica) derived from radar and firn core data. A 600 km transect from Dome C, *The Cryosphere*, 6, 1345-1358, doi:10.5194/tc-6-1345-2012, 2012.

Please also note the supplement to this comment:

<http://www.the-cryosphere-discuss.net/6/C2583/2012/tcd-6-C2583-2012-supplement.pdf>

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Interactive comment on *The Cryosphere Discuss.*, 6, 3667, 2012.

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