Comments to "Basal melt of the southern Filchner Ice Shelf, Antarctica" by Ole Zeising et al.

1 General comments

In this paper, the authors presented direct pRES measurements of basal melt rates on 79 locations of Filchner Ice Shelf. The study region covered a rather large region between ∼50 km downstream of Support Force Glacier and Berkner Island. Two pRES measurements are conducted in 92 locations repeatedly between about two years. The distribution of basal melt rates suggest in the study region, basal melt rates are quite evenly distributed. Results are also compared to the basal melt rates produced by remote sensing data sets. It's suggested that the quality of basal melt rates derived from remote sensing data sets is limited by the precision of vertical strain rate, and this can be improved by using state-of-art velocity fields.

The data set is a very useful product to constrain ocean model and remote sensing products in this region. However, there are some technical questions need to be addressed, such as the uncertainties of the measurements due to the methodology. Furthermore, ocean mechanism in this region and its impact on the basal melt rates should be better explained. Details will be mentioned in the specific comments.

2 Specific comments

L14: 'buttressing of'→ 'buttressing to'

L20: 'satellite remote sensing data'→'remote sensing data'

L45: Can you give more details of the measurements either here or in the method session? For example, how did you track the location of the measurements, using bamboos or gps coordinates...? Shifts of locations might leads to ill alignment of the basal layer.

Just curious, why no measurement is conducted closer to the grounding line of SFG, where more variability may appear? Is it a security consideration?

L65: 'location' → 'locations'

L66: How much does the periods influence melt rates? 323 days are more than a month less than a year. In the previous study of Sun et al., (2019) where hourly measurement of 1-year length is conducted in Roi Baudouin ice shelf, there is a clear seasonal variation in the time series. Melt mainly happens in summer, while in winter time the melt rate is close to zero and refreezing happens. That means without contribution of 42 melting time in summer, melt rates may be underestimated.

L66: 'between 323 and 356' → 'from 323 to 356'

L76 and equation (1): Here vertical strain rate is assumed to be constant within the whole ice column. How good is the assumption hold? Can you show the displacements of the internal layers? Maybe add a subplot in figure B1.

Fig 3: Could the authors add the error bar to the melt rates?

L101, Fig 3: Could the authors add the ice draft measured by pRES e.g. by using two y-axis?

L104-108: It's not clear to me how the vertical gradients of the ice temperature influence the distribution of basal melt rates distribution. And how does it explain the melt rates distribution observed in this article?

L111: What are the locations of the 18 pRES measurements? Can you show them in the map?

L114: 'and' → 'an'?

L118: For Fig.3, again, it would be straight forward to demonstrate the potential influence of geometry if the authors could add the ice draft of these locations. For Fig. B1, the two signals in the inset plot (d) are not very similar visually. How well is the correlation?

L119: The authors suggest that the higher melt of pRES016 is due to deeper ice draft and therefore higher thermal forcing. I hope the authors can discuss the impact of ocean dynamics to melt rates in this region, including thermal forcing, ocean circulation, and the influence of local boundary (depth of ice draft, slopes).

L120-122: Should this be a localized phenomenon? Will this conclusion hold at locations closer to the grounding line?

Fig.5: With melt rates and vertical strain rate difference between pRES and remote sensing results, can you add another column of the differences caused by surface mass balance? This would make this figure more informative.

References:

Sun, Sainan; Hattermann, Tore; Pattyn, Frank; Nicholls, Keith W. ; Drews, Reinhard; Berger, Sophie. 2019 Topographic shelf waves control seasonal melting near Antarctic Ice Shelf grounding lines. Geophysical Research Letters, 46 (16). 9824-9832. https://doi.org/10.1029/2019GL083881